MUNICIPAL JOURNAL AND ENGINEER

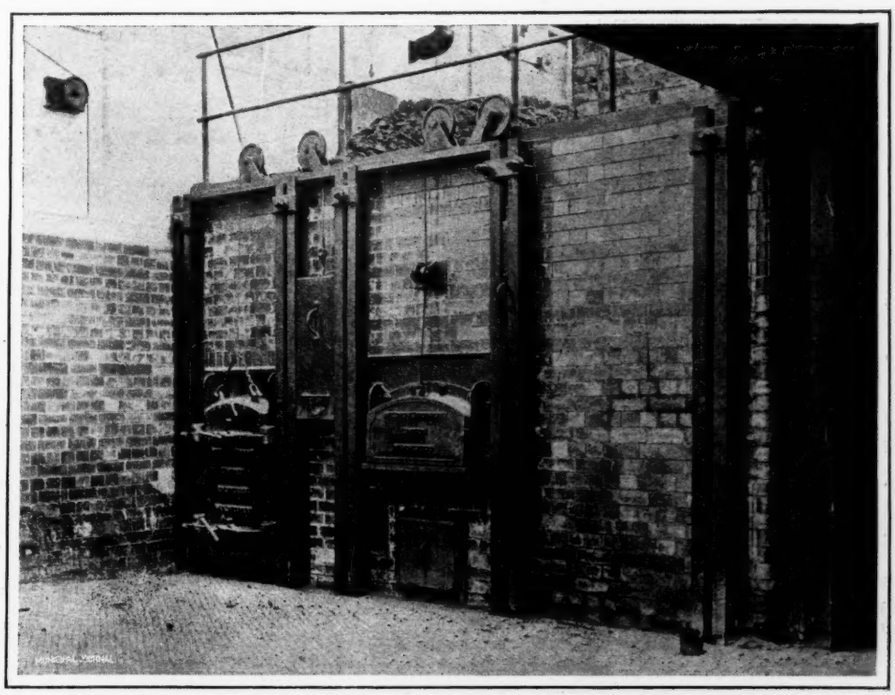
VOL. XVI NEW YORK, APRIL, 1904 No. 4

REFUSE AND SEWAGE DISPOSAL STATION

Combination Plant at Bolton, England—Power from Sewage Sludge and Refuse—Economy in Space and Running Expenses

By Col. W. F. Morse, Sanitary Engineer

AMERICAN cities have never manifested so keen an interest in economical methods for the disposition of refuse and sewage as at present. For this reason a few facts concerning combination plants in use in English cities will be opportune. It is generally conceded that in many respects the English practice in this particular field is superior to that found on this side of the Atlantic. Whatever the reason may be, it is true that English municipalities take more readily to new ideas than to the American cities. They are continually seeking better ways of doing things, but they are wise enough to prove that a new way is best before discarding the old. One of the latest developments in this line is the establishment of combination sewage sludge and garbage destructor plants. The latest installation of this kind is the Hacken Sewage Works, at Bolton, England, and the brief description that follows, typical of plants previously installed elsewhere in England, and on the Continent, will be of value to American cities as illustrating methods that can be employed with advantage in this country wherever similar conditions demand it.



CLINKERING AND COMBUSTION CHAMBER DOORS OF BOLTON'S (ENG.) DESTRUCTOR

FACTS ABOUT THIS ENGLISH CITY

Bolton has a population of 172,000, and covers an area of twenty-four square miles. Even compared with the generally well conducted English cities, Bolton has an enviable reputation for being thoroughly business-like in its administration and capacity for organizing commercial enterprises. For the past decade the city has applied an average of $70,000 a year from the income of the Water Department to the relief of the tax payers; from the Gas Plant, annually, $110,000; from the City Markets, annually, $15,000, and the city lighting plant, recently installed, is rapidly being developed into a paying property. The city owns and operates its tramways, ice-stores, and numerous other smaller enterprises, all of which are conducted to the profit and benefit of the people.

The education and amusement of the people are also well provided for, as there are well-conducted technical schools, public libraries, beautiful and extensive parks and recreation

grounds, hospitals, public baths and Turkish baths, all of which are generously equipped and administered.

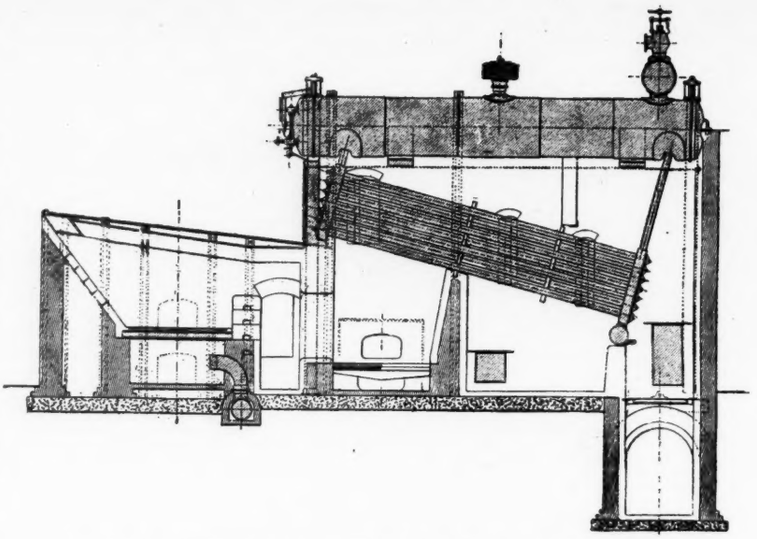
It is not surprising that a city possessed of so progressive a spirit should be in the van in the disposition of its refuse. Under the leadership of Mr. Alderman Tonge, the city has devised and put into service a disposal station that is a model for other English cities. The total cost of the sewage depots, outfall works and farm, including also the destructor plant, buildings, sidings, etc., was $625,000.

The Combination Refuse Plant

This combination sewage and garbage disposal station is contained in two brick buildings into one of which the sewage flows by gravity from the city main trunk sewers. It passes into settling basins where it is treated with lime and other chemicals, and after the effluent has been run off, the residuum, by means of Tangye steam pumps with a capacity for raising fifty tons twenty feet in one hour, is delivered to powerful sludge rams operating under pressure of 100 pounds to the square inch, by which the sewage is forced into the presses. These presses are of special construction, fitted with patent gear for operating, and each contains forty fitted pockets of canvas, that when under enormous pressure produce forty cakes of sludge, thirty-six inches square, and one and one-half inches thick.

Each of the eight presses is capable of turning out at one charge from five to six tons of wet sludge in cakes, containing from 30 to 40 per cent. of moisture and from 17 to 20 per cent. of combustible matter, the remainder being a combination of mineral salts which, under the action of fire, becomes a reddish-brown ash of considerable weight, and in volume about 30 per cent. of the original quantity.

The sludge cakes are carried by two lines of conveyors to the destructor house, and by a short traverse line are conveyed to each destructor in turn.

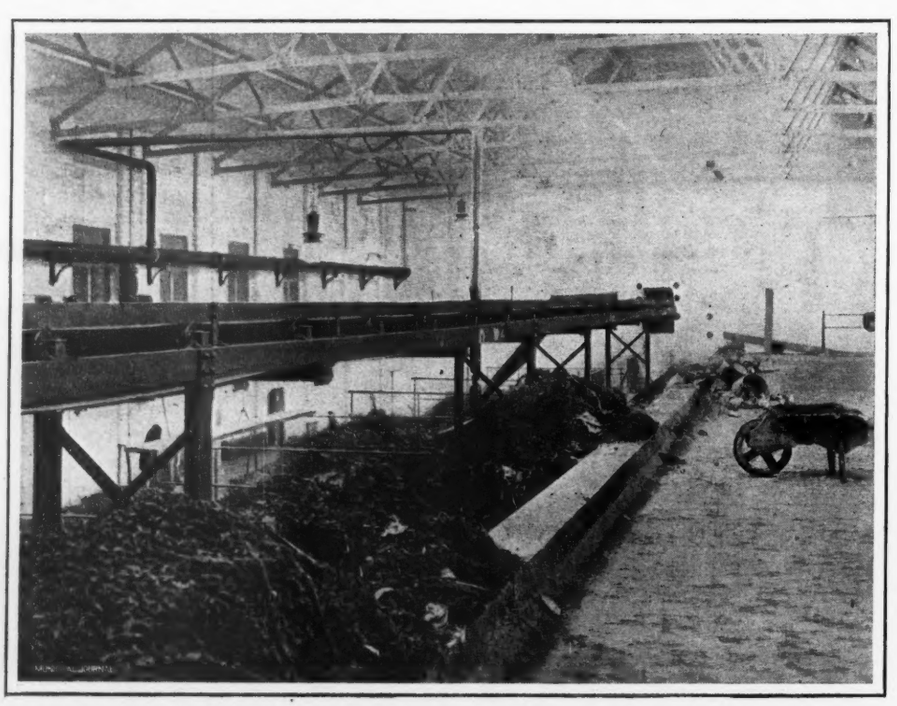


LONGITUDINAL SECTION OF A BEAMAN & DEAS DESTRUCTOR, WITH STEAM BOILER, AIR BLAST, ETC.

The Meldrum Brothers, of Manchester, installed the destructor plant, selecting the Beaman & Deas furnace as the one best suited to the work.

Description of the Plant

The destructor consists of eight cells, built in pairs side by side, each pair of cells having a common combustion chamber from which the heat generated passes into a main flue, the hot gases from each cell alternately uniting with and consuming the green gases from the other. From the main flue the heat passes into two branch flues, in each of which is erected a 100 H. P. Babcock & Wilcox boiler (each having a heating surface of 1,790 superficial feet) between the water tubes of which it passes and thence travels up the chimney. If desired the heat can pass directly into the chimney, but the arrangement referred to provides a way for converting this otherwise wasted heat into steam power.



DUMPING PLATFORM AND CONVEYOR, HACKEN SEWAGE WORKS

The capacity of each unit, or pair of cells, is twenty (long) tons of mixed sludge and town's refuse daily, and there is developed and maintained 100 H. P. of steam for the same period. The temperature of the combustion chamber in the destructor is 1,800 to 2,000 degrees, insuring absolute destruction of odors and inflammable gases without nuisance. The heat generated with no other fuel than the material to be destroyed, is maintained by the forced air draft produced by a fan driven by a special engine, and will evaporate three-quarters of a pound of water for each pound of mixed waste destroyed. The whole capacity of the plant is one hundred and sixty tons of town refuse and sludge cake in twenty-four hours,

with the production of 400 H. P. in steam, maintained at a pressure of 120 pounds to the square inch.

This power is utilized for driving the engines for the fan and compressed air (100 pounds per square inch) for pumping the sewage and effluent, operating three conveyors for handling the sewage cakes, the lime mixer for the sewage precipitation, and the dynamos for ten arc and forty-four incandescent electric lights.

In this work no fuel is necessary to obtain power except the sludge and the city mixed refuse. The steam power developed is far more than is needed for the operation of the plant. The work is carried on in two adjoining buildings, occupying less than an acre of ground, without objectionable odors or nuisance of any kind, and with economy of installation in ground and plant that cannot be equalled by any other system or method of sewage and garbage treatment.

The Only Example in This Country

The only example of this combined system of sewage and garbage disposal ever known in this country was the work done at the World's Fair, Chicago, during six months of 1893.

From the collection tank in all the large exhibition buildings the sewage was forced by compressed air to four great steel reservoirs at the central station and while discharging into these reservoirs it was mixed with lime and other chemicals which precipitated the solids. After settling, the effluent was run off into the lake, the residuum forced into filter presses and the sludge cakes taken to the adjoining crematory in quantities of fifteen to twenty tons daily.

Two Engle cremators, designed by the writer, were operated continuously day and night, using as fuel oil sprayed by compressed air from a positive blower, and during the six months of the Fair burned 8,000 tons of garbage and sewage sludge without offense of any sort. The ashes were used for roads and path making in the Exposition grounds. All the sewage and garbage resulting from the presence of twenty-seven and one-half millions of people was disposed of by this process on the grounds, with an economy of labor and fuel never since equalled.

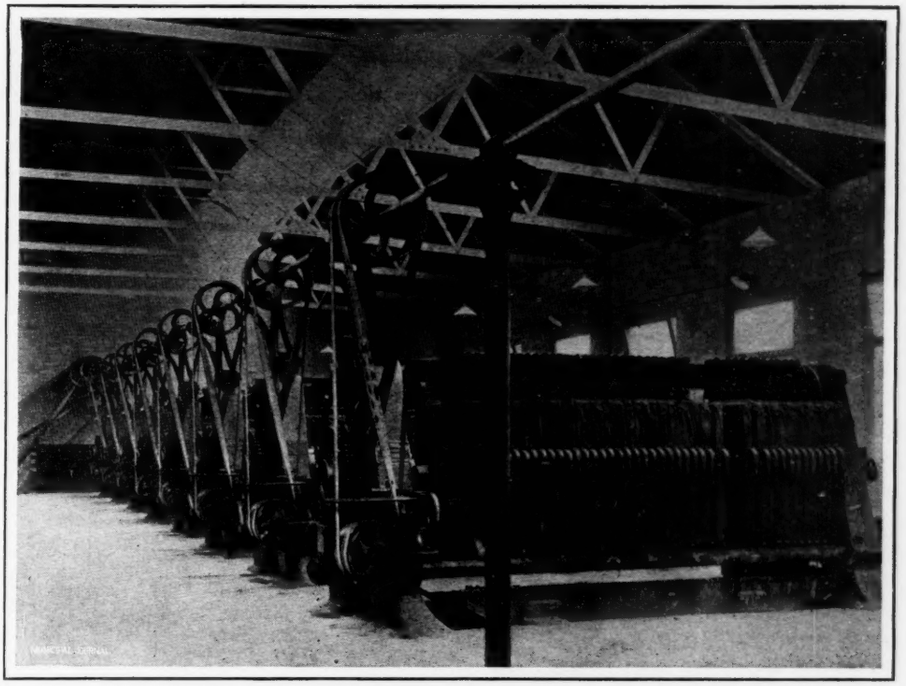
Advantages of This System

There are several points in this method of combined sewage and garbage disposal which are well worth the consideration of American towns. There can usually be found one or two locations to which all the town sewage can be brought by gravity through intercepting trunk sewer lines. As a rule these points are within the city limits, and are not so far away as to prohibit bringing the town's garbage and refuse to the same place.

The ground required for this plant is not large in area, and therefore should not be expensive to purchase. The plant itself, including all the buildings, apparatus and machinery, would cost far less than the ground area and construction that would be required by a broad irrigation, chemical precipitation, intermittent filtration or a septic tank system of sewage disposal.

The maintenance of a plant, owing to the fact that the garbage and refuse furnishes steam power, is less in cost than either of the above systems separately, if power is required, and power in some form is almost always necessary.

Although the effluent from the presses is not a potable water, if it be discharged into a river or lake and mixed with a large volume of water there is no offense or danger therefrom. By using chemical processes at times of epidemics of zymotic diseases sewage can be thoroughly disinfected and all bacterial life destroyed before the effluent is released.



SLUDGE PRESSES WITH DRIVING ARRANGEMENT, HACKEN SEWAGE WORKS

Why Sewage Should Be Purified

The chief objection to the deposit of sewage in small rivers, lakes and shallow ocean bays is the gradual accumulation of thick beds of foul matter in the slack water of streams and on the bottom of lakes and land-locked salt-water harbors. The rivers in the Middle West, fouled by the continuous discharges of sewage from all the towns on their banks, are in times of low water only elongated sewers. The beds of shallow lakes at the outfalls of great trunk sewers are gradually rising as the deposit of solid matter becomes deeper year by year.

The port of Havana, Cuba, is an example of a harbor, with small tidal scour, filling up by a sewage deposit which is already many feet in thickness. The same results would take place in the sluggish waters between Staten Island and the Jersey shore, if the sewage of the towns in that State on the Newark and Passaic rivers were turned into those streams without purification.

BUILDING GOOD ROADS IN MARYLAND

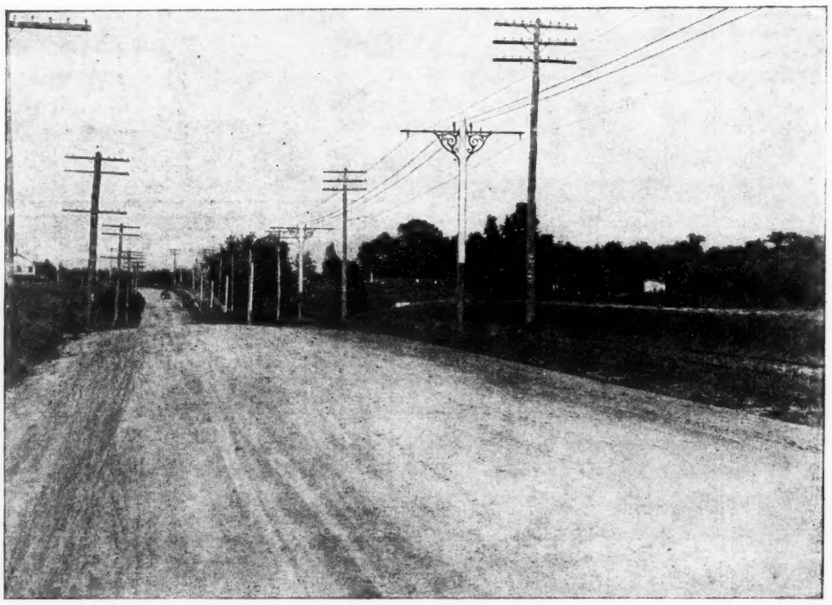
How the State Geological Survey Promotes Good Roads—Specimens of Roads Built—Specifications for Macadam and Telford Roads

The gospel of good roads has been preached in Maryland and the work is still going on. It has not been confined, by any means, to preaching, as will be seen from the work done and reported in the third report on highways of the State prepared by Mr. A. N. Johnson, highway engineer of the State Geological Survey. The work during 1902-3 included both field and laboratory. A brief statement of the work done on a few roads will give an idea of the work on all.

Special Road Improvement

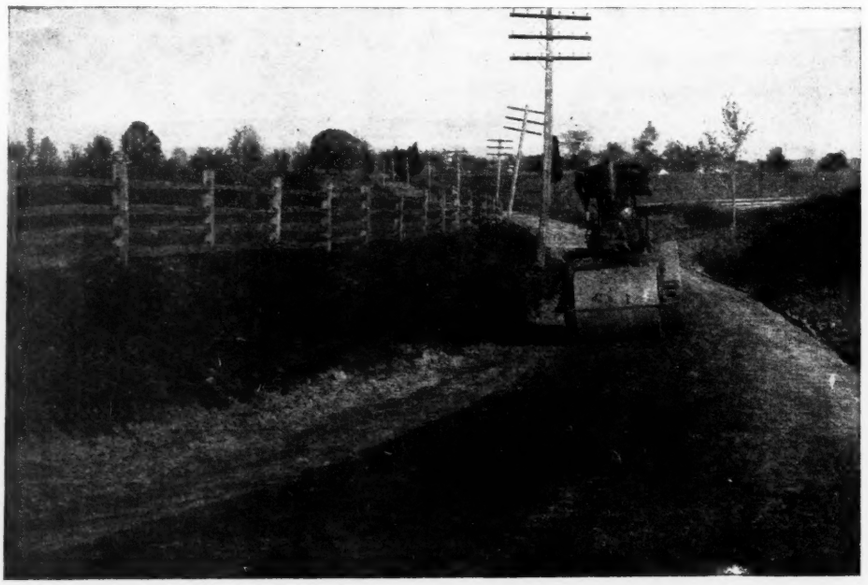
The improvement of Eastern avenue was undertaken in March, 1903, for a distance of 2.35 miles. No hard road metal exists in the vicinity, so it was necessary to ship all material by rail. The foundation was made of slag, on the score of economy, and the upper course trap rock, slag screenings being used for the binder. A layer of five inches was put on, with a three-inch layer of rock, broken to one and one-half inches, above. The slag rolled smoothly and did not settle as much as broken stone, but was not too hard to make a perfect bond with the rock layer. The slag screenings bonded better than the rock screenings. Gravel shoulders, six feet wide, were laid on each side. The cost of the work, by contract, was 47 cents per cubic yard for earth excavation, $1.40 per cubic yard for gravel, and 55 cents per square yard for eight inch macadam. The principal items of cost of building the Belair-Churchville Road, which was completed by contract in the fall of 1902, were 40 cents per cubic yard for earth excavation, 90 cents for ledge, $4 for dry and $5 for cement rubble masonry, 30 per square yard for eight-inch Telford, $1.60 for broken stone, per cubic yard.

In constructing the T-B Road in Prince George's County, great difficulty was encountered on account of the grades. The work was done in 1900-1, but the grades were as high as 13 per cent., so in 1902 the grades were reduced. At one point, with even cuts of ten feet, a better grade than 8 per cent. could not be secured, and then it was necessary to extend the grade a distance of 1,300 feet. In 1903 another grade was lowered from 12 to 6 per cent. This is a gravel road and the severe weather of winter caused the clayey matter to cut through, so it was deemed advisable to resurface the road with a sandy gravel, the work being done by day labor. The illustration shows a concrete culvert on this road, five feet high and having a four-foot waterway. The end walls are twelve feet above the stream level and wing walls protect both ends.



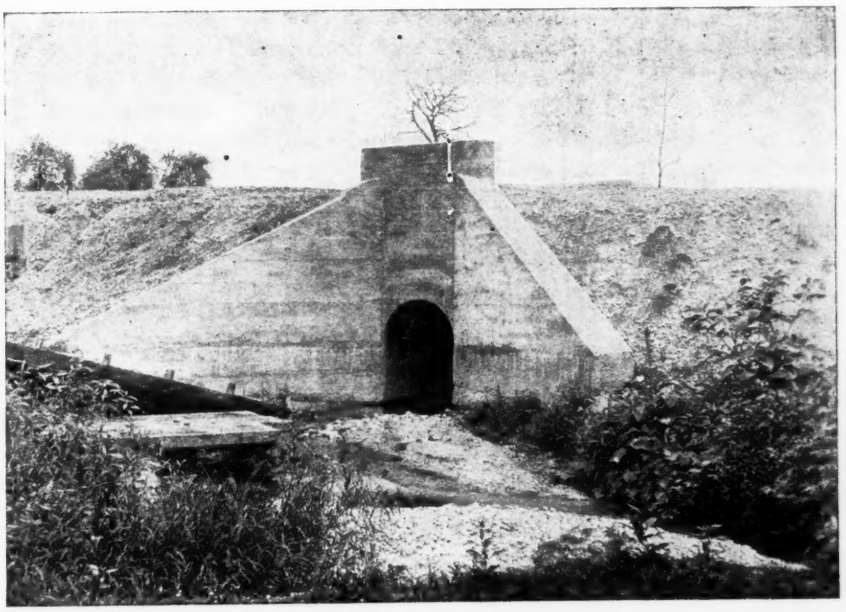
EASTERN AVENUE, BALTIMORE COUNTY—MACADAM ROAD WITH ROCK TOP AND SLAG FOUNDATION

The Centerville-Chestertown Road was built as a sample stretch for which $500 was appropriated by the county. The section of road selected was over a heavy clay soil and so level that water stood in the ditches. The mud made it



OASTLER ROLLER FINISHING MACADAM ON BELAIR-CHURCHVILLE ROAD, HARFORD COUNTY

impassible in winter and spring, while a sandy stretch caused equal trouble in dry weather. Slag was placed on the clay portion, after the road was shaped with a road machine, which made shoulders at the sides. The road-bed was rolled and ten inches of slag laid on at the center, sloping to seven inches at the sides. Eleven hundred feet of road were covered fifteen feet wide, 458 tons of slag being required with about forty-five tons of finer material for binder. The slag was well watered and rolled by a three and one-half ton horse roller loaned by the Good Roads Machinery Company of Kennett Square, Pa. The estimated cost of a fifteen-foot slag road, after hauling the slag in barges 100 miles and by wagon one and one-half miles, is placed at $3,476 per mile, including 2,400 tons of slag, and shaping of road-bed. For a twelve-foot road the cost is placed at $2,800 per mile.



CONCRETE CULVERT ON T-B ROAD, PRINCE GEORGE'S COUNTY

SLAG SECTION ON CHESTERTOWN-CENTERVILLE ROAD, QUEEN ANNE'S COUNTY

Road Specifications of Maryland Survey

The Geological Survey has drawn up a set of specifications which are well adapted to the present requirements of Maryland. One basis of payment is the number of square yards in finished surface, and provision is made for roads of various thicknesses. Another basis is the number of tons or cubic yards of material used, but the former is preferable, according to Mr. Johnson. A digest of these specifications follows:—

Earth Work. Wherever changes in grade are shown on plans, the proper grade must be formed both as to width and shape as indicated. Material excavated from road and used for filling is to be paid for as excavation only; material taken from outside is to be paid for as burrow excavation. Only boulders over one-half a cubic yard or ledge requiring blasting to remove, will be considered ledge excavation. Material for embankment is to be spread in not over twelve-inch layers and must not contain roots, etc. Slopes in cuts must be left at one to one, unless otherwise directed, but never more than one and one-half horizontal to one vertical.

Masonry. Dry rubble masonry should be composed of sound quarry stone. No stones with rounded surfaces must be used. They must be laid to give a bond of six inches, larger stones are to be used for foundations and one-third of the work is to consist of headers. Covering stones over culverts must be at least twelve inches thick and not less than one-fourth their length in thickness; must have a bearing on the side walls of at least a foot; and must be laid closely together and crevices filled with spalls and cement mortar. In cement rubble masonry the stones are to be laid in courses not less than a foot thick with alternate headers and stretchers. Joints are not to be over one inch wide and are to be filled with cement mortar. This mortar must be one part American cement and two parts clean, sharp sand, or one part Portland cement and three parts sand. Mortar must not stand more than thirty minutes.

Drain-pipe. Joints of pipes are to be caulked with cement mortar. All pipes must be laid to a true alignment and have a firm bearing. No other allowance, except cost per foot for laying shall be charged except the trench be over three feet deep and wider than one foot on each side of pipe.

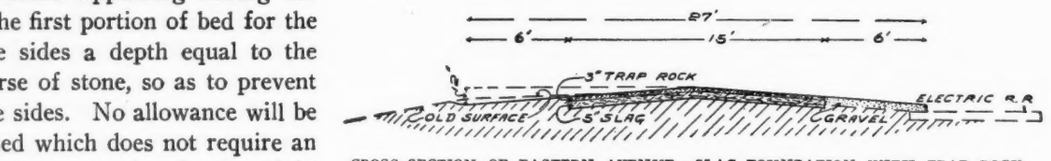
Macadam Construction. There are to be three classes termed "A," "B," and "C," each to consist of three layers of broken stone, the thicknesses, after rolling, to be: For "A," 1st course, four inches; 2d course, two inches; for "B," 1st course, five inches; 2d course, three

inches; for "C," 1st course, six inches; 2d course, four inches. The third course to be as described later. The road-bed must be rolled hard and firm, sandy soil that will not compact being covered with clay. In cuts and fills, the road-bed must be free from all vegetable or spongy matter. All depressions in the surface appearing during the rolling must be filled. The first portion of bed for the stone must be below the sides a depth equal to the thickness of the first course of stone, so as to prevent the stone spreading at the sides. No allowance will be made for excavation of bed which does not require an average change in the present grade of over eight inches and the price for preparation of bed is to be included in that for the macadam.

The first course of macadam must be of sound stone broken to from three to two inches, to be called "No. 1." Stone must be spread from piles at side, from a dumping board, or from specially constructed wagons, but is not to be dumped directly on the road-bed. Rolling must be done with a ten-ton roller until a firm and smooth surface without depressions is secured. If it do not readily compact, water may be sprinkled on it or sand lightly spread. Rolling must begin at the sides and work towards the center. After the first course has been made, earth shoulders must be constructed on each side against which the second course stone is to rest. Shoulder material must be free from vegetable matter and sand that will not compact, and must be sufficiently high to make a continuous surface with the second course when rolled.

The second course must be as wide as the first and consist of one to two-inch stones to be called "No. 2." The rock must be trap and have a "co-efficient of wear" as determined by the Geological Survey of not less than 15. The stone for the second course must be spread and rolled as in the case of that for the first.

The third course must be trap rock screenings from dust to one-inch pieces and in quantity to just cover the second course. It must be spread as in the case of the first and second courses. The screenings are to be sprinkled and rolled with a ten-ton roller until hard and smooth and the water flushes to the surface.



CROSS-SECTION OF EASTERN AVENUE—SLAG FOUNDATION WITH TRAP ROCK TOP COURSE

Telford Construction. The road-bed must be prepared as for macadam. The first course stone must have sharp corners, be five to eight inches deep, three to six inches wide and not over sixteen inches long. The stones are to be set by hand to rest on the broadest edge lengthwise across the road and close together. Spaces are to be filled with spalls, the interstices with earth, and the whole rolled with a ten-ton roller. The first course must be eight inches thick, earth shoulders are to be made as in the case of macadam, the second course is to be as for macadam and four inches thick, and the third course is to be as for macadam.

Resurfacing. The present road surface is to be loosened and scraped. The material may be obtained by loosening the present stone foundation until a proper shape can be secured, or broken stone "No. 1" size may be used. After shaping the material for the first course, it must be rolled smooth and firm with a ten-ton roller as for macadam construction. The first course must not be less than five inches thick. Earth shoulders are to be made as for macadam. The second course must be similar to that for macadam and not less than three inches thick after rolling. The third course must be as for macadam.

METERS WILL REDUCE CONSUMPTION 40 PER CENT.

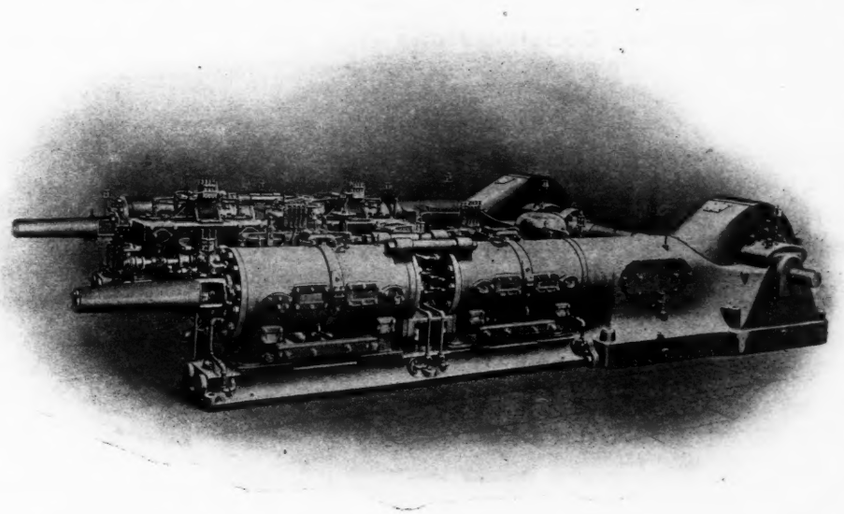
About ten miles of cast iron mains were laid in the streets of Schenectady, N. Y., during the past year, the cost to the city being $76,838.67. Nearly one-third of all the hydrants in the city were set during 1903, the total number at the present time being 787. The total number of miles of mains is sixty-five, supplying 11,587 consumers. The equipment of the Rotterdam pumping station consists of two Dean triple expansion direct-acting vertical pumps with a capacity each of 6,000,000 gallons per day. Four horizontal tubular boilers feed these pumps and there are two electrically driven centrifugal turbine pumps with a capacity of 12,000,000 gallons each per day. Superintendent George T. Ingersoll recommended that a concrete retaining wall be constructed in place of the old wooden wall on the river side of the Ferry Street pumping station, which is not used now except in case of a large fire, when the river water can be drawn upon by this means. He recommended that the station should be entirely abandoned and the machinery disposed of. He urged that a large settling and storage reservoir to hold at least a week's supply be built as soon as possible. He also recommended that contracts for water pipe and specials be entered into during the winter months, as the prices that can be secured then are much below those during the remainder of the year. He called attention to the unwise method of the aldermen ordering the laying of mains in streets that have not been graded or had curb lines established. Nearly $2,000 was spent in 1903 lowering mains and resetting hydrants to conform to grades established after the pipes were laid. The conduits of the telephone and street railway companies were laid without regard to the location of the water pipes and, in many instances, lie directly over the pipes so that the conduits must be broken to get at the pipes in case of a break. He recommended that the introduction of meters be carried on as rapidly as possible until all taps were so treated. Either the consumption will be reduced 40 per cent. by this means, or the receipts from water rents will be increased in the same ratio. He also criticised the practice of the aldermen ordering the laying of water mains without considering the question of where the funds were to come from.

SPECIAL FIRE MAINS FOR NEW YORK

Proposed Plan to Supply 3,000,000 Gallons of Water Per Hour from Three Electric Pumping Stations—Salt or Fresh Water Can Be Used

SCARCITY of water has been a handicap to the New York firemen, and especially to those in the Borough of Brooklyn. If the plans of the present municipal administration are carried out, however, New York will have a water system for fire purposes second to none. A preliminary report on a proposed high pressure fire service has been prepared by Nicholas S. Hill, Jr., chief engineer of the Department of Gas, Water Supply and Electricity, describing a system to cover an area of about five square miles in a section of the city where the fire losses have been heaviest.

To protect this district it is proposed to install three pumping stations, two on the North and one on the East River, at different corners of the district and each capable of pumping to any part of the distribution system. The subdivision of the pumping plant will make it possible to supply double the capacity of the present system even if one of the stations becomes disabled.



WESTINGHOUSE GAS ENGINE—TYPE INSTALLED IN PHILADELPHIA'S SPECIAL PUMPING STATION

The great damage done to pipe lines, valves, etc., by salt water, rendering them liable to break down at the critical moment, make it advisable to plan for the pumping of fresh water, but provision was made in this plan for drawing on the river water in case the fresh water supply should be interrupted. Then, too, the fire-boats can be connected directly to the system and a good supply of salt water be secured if the stations should break down. These boats, five in number, have a capacity of about 2,400,000 gallons an hour against a pressure of 150 pounds. This is about two and one half times the combined output of the twenty-four engines that respond to a four-alarm fire.

Each of the stations is to have a capacity of 1,000,000 gallons, with a pressure of 300 pounds at the stations and about 200 at the farthest hydrant. This service would then furnish more than three times the water supplied by the engines, and the pressure would be more than double. It is calculated that each station will supply thirty-two streams through three-inch hose with one and three-quarter-inch nozzles. It is proposed to have two five-way hydrants at street intersections, each hydrant delivering approximately 2,600 gallons per minute. Thus, from the four corners of a block, forty streams can be played on a fire, or 20,800 gallons per minute. This is one-third more water than is pumped by the engines at a four-alarm fire.

The report states, also, that "ninety-six lines of three-inch hose, not exceeding *350* feet in length may be concentrated on a single fire when the three stations are operating simultaneously." According to the plans showing the location of hydrants; viz., two at street intersections and, at certain places, two at the center of the long blocks, it will not be possible to get more than sixty streams of the kind proposed without using much longer lines than 350 feet. These sixty streams would give about 29,000 gallons per minute.

The question of the character of the energy to be used in the stations is a mooted one, but Mr. Hill has reported in favor of electricity and the turbine pump. The steam plant was out of the question because of the long periods of idleness of the plant and the necessity of its starting up at a moment's notice. As between the gas engine and the electric motor, Mr. Hill's investigation leads him to believe that the electric companies in the city would be able to supply the maximum current (15,000 h. p.) if properly constructed cables are laid in duplicate, so as to provide against accident. In comparing the two, Mr. Hill presented the following points in favor of electricity: Economy in first cost of machinery and buildings; economy in space necessary for installation, thus reducing the land required; economy in cost of wages, maintenance, repairs, and renewals; simplicity. The relative cost of power could not be stated accurately, because Mr. Hill had not ascertained the price for which gas could be obtained, but he presented an estimate of the cost of one station for both gas and electric engines, the total cost of the former being placed at $718,000 and of the latter at $345,000. The cost of operation per year he calculated at $121,050 for the gas and $61,760 for the electric station, $17,000 per year being allowed for the gas and $13,200 for electric current at 4½ cents per kilowatt-hour. The total cost of the entire installation complete with the distribution mains, telephone system and 20 per cent. allowance

for contingencies and superintendence, Mr. Hill placed at $3,950,000 for electric and $5,293,200 for the gas stations.

While the electric stations will not cost more than about half those run by gas, the advantage of cost is not so great as would seem at first thought. The cost of operation, as has been pointed out by an engineer, furnishes a good argument in favor of the gas engines such as are in use in similar stations in Philadelphia, where the Westinghouse gas engines have been installed. These engines consume about twenty cubic feet per horse-power-hour, or 2 cents per horse-power-hour with gas at $1. This makes cost of fuel for each station $1,000 per month for ten hours' service. It is a question whether electric current could be obtained cheaper than 5 cents per kilowatt-hour, even at the ordinary commercial rates. It is evident that such rates could not be obtained for these stations as the companies must have 15,000 h. p. available at a moment's notice, irrespective of the amounts supplied other consumers, although this amount would not be continuous and, therefore, warrant the increased producing capacity. The cost of current would therefore, be sufficiently large to cover the keeping of this large amount of energy ready for instant delivery, and the commercial rate would not apply. But at the 5-cent rate, the cost for 100 hours would amount to $55,000 for the three stations, while $30,000 would pay for an equivalent energy from gas. Gas is stored in enormous quantities, while a sudden draft on the electric companies for these three stations, or even one, would be a serious problem for them and one which it is doubtful if they could handle. A late report of the State Railroad Commission showed that there is a lack of electric power, and a surplus will not exist for a long time to come. It is a question, also, if the turbines can produce the pressure required.

The use of the special system for street cleaning was not advised because of the great pressure on the hydrants which cannot be built to withstand rough usage of ignorant workmen. Mr. Hill also recommended that other methods should be fully investigated before any one is settled upon.

PORTLAND CEMENT*

And Its Uses in Engineering Constructions—The Chemical Constitution of Cement, Continued

By E. Kuichling, C. E.†

In the preceding issue of the Municipal Journal and Engineer, pp. 105-108, a brief outline was given, of the most noteworthy early chemical investigations of the constitution of Portland cement prior to the publication of Le Chatelier's researches in 1887 and 1893, along with an abstract of the latter; and in the following articles the more recent studies of the subject by other eminent authorities will be considered.

Experiments of S. B. and W. B. Newberry

The publication of Le Chatelier's investigations stimulated a number of other chemists, who were interested in the manufacture of cement, to seek further experimental light on the obscure reactions attending the composition and hardening of hydraulic mortars, but no substantial progress appears to have been made in this direction until 1897, when S. B. and W. B. Newberry presented to the New York Section of the Society of Chemical Industry an important paper on "The Constitution of Hydraulic Cements." Taking Le Chatelier's work as a basis, it appeared very desirable to these authors to carry the experiments further, and ascertain what proportions of lime, silica and alumina will yield cement of the highest possible quality.

The questions which they attempted to solve by synthetical experiments with pure materials were as follows:—

"1. What proportions of lime must be employed for given percentages of silica and alumina in a clay?"

"2. Can a general formula be stated, applicable to all clays, which shall indicate the proportion of lime that will give the best result with each?"

"3. What effect has the presence of oxide of iron, in the clay used, on the proportion of lime required, and on the quality of the resulting cement?"

"4. Is the presence of alkalies in the raw materials necessary to the production of good cement?"

"5. Is magnesia capable of replacing lime in cement mixtures, or is it inert, as has often been stated; and how does magnesia affect the quality of the cement obtained?"

The materials used were, silica, alumina, carbonate of lime, iron oxide and magnesia, all practically chemically pure and in the form of impalpable powder leaving no residue on a sieve of 180 meshes to the linear inch. The mixtures were made in calculated proportions by rolling backward and forward and then sifting three times through a 60-mesh sieve, after which they were moistened with water, made into cakes, dried, broken into small pieces, and burned in a specially prepared gas furnace. About 300 grams of material was used in each experiment and exposed to direct contact with the flame. The heat was varied to suit the mixture, an intense white heat being easily obtained with sufficient blast pressure. The burning of each charge occupied about one hour, or about one-half hour after the desired intense and constant heat was obtained. On cooling, most of the material was found to be well "sintered" or brought to the stage of incipient fusion. The lightly-burned pieces on the top of each loose pile or charge were rejected.

"It is generally agreed that cements of the highest strength and most vigorous hardening properties are those which contain the highest proportion of lime consistent with constancy of volume, *i. e.*, freedom from tendency to expand and crack. In these experiments the "high-lime limit" was determined by means of the hot test, by making a small pat

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† Engineering Editor, Municipal Journal and Engineer.

of the cement, allowing it to set over night and exposing it for four or five hours to steam at about 98° C. (208° F.). Tests were also made by placing the pats in steam as soon as made, but this plan proved less severe and less distinct than the first-named plan."

"The results obtained were very distinct and striking, cements containing a very slight excess of lime showing marked expansion and cracking. In this manner the limit of lime which could be brought into combination could be fixed within 1 per cent. In most cases the pats were kept in furnace at an intense white heat, the former proving very refractory, while the latter were found to be very fusible. The results of these experiments have been arranged for convenience in the two tables below:

These results differ in some respects from those obtained by Le Chatelier, and are attributed to the use of higher temperatures with the materials in a very finely divided condition and thoroughly mixed. The first three calcium silicates all show soundness or constancy of volume both in cold water and in steam, while the fourth was unsound before

I. CALCIUM SILICATES *

Formula.	Composition of Mixture: Chalk	Quartz	Ratio, CaO to SiO_2	CaO	SiO_2	Pat Test. At 1 day	At 7 days	At 6 weeks	Hot Test.	Character of Clinker
$2CaO, SiO_2$.....	200	60	1.85	65.11	34.89	Hard	Hard	Hard	Sound and hard	Shrunken and sintered
$2.5CaO, SiO_2$.....	250	60	2.33	70.00	30.00	Soft	Fairly hard	"	" " "	"
$3CaO, SiO_2$.....	250	50	2.80	73.68	26.32	Soft	" "	"	" " "	Shrunken and slightly sintered
$3.5CaO, SiO_2$.....	256	44	3.27	76.56	23.44	Hard, cracked	.....	"	" " "	"

II. CALCIUM ALUMINATES

Formula.	Composition of Mixture: Chalk	Alumina	Ratio, CaO to Al_2O_3	CaO	Al_2O_3	Pat Test. At 1 day	At 7 days	At 6 weeks	Hot Test.	Character of Product
$2CaO, Al_2O_3$.....	200	102	1.10	52.38	47.62	Set quick	Hard	Hard	Sound, fairly hard	Fused white slag
$2.5CaO, Al_2O_3$.....	250	102	1.37	57.85	42.15	" "	Curved & cracked	Soft & cracked	Curved, cracked soft	" " "
$3CaO, Al_2O_3$.....	300	102	1.65	62.23	37.77	" "	Disintegrated in water		" "	" " "

boiling water for several hours after exposure to steam, but no additional information was thus obtained, since pats which remained sound for five hours in steam invariably continued sound in boiling water."

"In addition to the hot and cold pat tests, tensile strength tests were also made in many cases on briquettes one-half inch square in section. * * * It is not claimed that the results of these tests are of any especial significance; they were made simply in order to determine whether the artificial mixtures yield cements which compare favorably with commercial products."

To study the combinations of lime with silica and alumina separately, a number of different mixtures of carbonate of lime and silica and carbonate of lime and alumina were made and burned, thus obtaining a series of calcium silicates and calcium aluminates. The first series were made in the proportion of 2, 2.5, 3 and 3.5 molecules of lime to one of silica, and the second in the proportion of 2, 2.5 and 3 of lime to one of alumina. Both series were burned in the gas being placed in cold water, although it subsequently became very hard. None of them except the first, however, showed any decided set at one day, and the gradual hardening properties were more like those of hydraulic lime than Portland cement. On the other hand, the calcium aluminates all set very quickly, but only the first mixture (in the proportion of 2 molecules of lime to one of alumina) exhibited a constant volume and good hardening properties.

The authors then assume that the tri-calcic silicate and di-calcic aluminate are the most basic compounds of lime with silica and alumina that can exist in good cement, and arrive at a formula for computing the maximum proportion of lime to be used with any clay of known composition in making Portland cement. This formula is: $X(3CaO, SiO_2) + Y(2CaO, Al_2O_3)$, in which X and Y have values varying with the relative proportions of silica and alumina in the clay. As the tri-calcic silicate corresponds to 2.8 parts of lime by weight to one part of silica, and the di-calcic aluminate to 1.1 parts of lime to one of alumina, the aforesaid formula can be transcribed so as to represent the maximum percentage of lime by weight that should be present in a correctly balanced cement, as follows: "Per cent. lime = per cent. silica × 2.8 + per cent. alumina × 1.1."

On applying the authors' formula to actual practice they found that some of the best cements correspond to it almost exactly, while others show a slight deficiency of lime; but it must be remembered that the formula represents the *maximum* amount of lime which can safely be used, and that this maximum can be reached in practice only by the most thorough grinding and mixing of the raw materials.

The authors also point out that their formula is similar to that of Le Chatelier for the permissible minimum quantity of lime, except that in the latter tri-calcic aluminate appears

*NOTES.—*Table I, First Case:* Clinker translucent and crystalline. On cooling, fell entirely to powder, as described by Le Chatelier. Some of the pieces were quenched with water, by which the powdering or dusting was prevented, and on being dried and ground they yielded a white powder. A pat made of this set slowly, becoming very hard on glass at 7 days.

Second Case: Clinker white and firm on cooling; no dusting. Pat showed little setting quality, but hardened slowly in water.

Third Case: Clinker as in second case. On being pulverized, the powder showed no warming when mixed with water. Pat set fairly at one day, but was still rather soft at 7 days.

Fourth Case: Clinker soft, very little sintered, but no dusting. Pat set hard, but left glass, curved slightly and cracked before placing in water.

Table II, First Case: Burned by direct heat, fused to a white slag. Burned in platinum crucible, product was strongly "sintered" or semi-fused. Powder white, and on being mixed with water, heated strongly and set in a few seconds like plaster.

Second Case: Same as in first case. Pat set quick and off glass at one day; curved and cracked at 3 days; soft and cracked at 6 weeks.

Third Case: Same as in first case. Pat set quick, curved and cracked before placing in water, and disintegrated entirely in water.

in the second term instead of di-calcic aluminate. "The difference in composition of cements made according to these two formulas is, of course, slight, especially when using a clay low in alumina. With high percentages of alumina, however, the difference is much more marked." To determine the relative merits of the two formulas, a series of mixtures of pure chalk, silica and alumina were prepared according to both, and were then burned, ground and tested for constancy of volume and tensile strength.

"In these mixtures the composition was calculated so that the resulting cements should contain 2, 4, 7 and 12 per cent. of alumina, respectively. It was found that the presence of even 4.2 per cent. of di-calcic aluminate ($2CaO, Al_2O_3$), equivalent to 2 per cent. of alumina, was sufficient to give the tri-calcic silicate excellent hardening properties, equal to those of the best cements. With increasing proportions of alumina the clinker became much more fusible, the mixture containing 12 per cent. of alumina fusing to a semi-transparent slag and yielding a quick-setting cement. This corresponds exactly with the results obtained in practice with aluminous clays, such mixtures having been found difficult to burn correctly, owing to their fusibility."

"The clinkers obtained from these mixtures were faintly bluish in color and about like good Portland cement clinkers in degree of sintering and hardness, except in the case of the mixture with 12 per cent. alumina, which gave a hard, semi-fused clinker, difficult to grind. The cements obtained were perfectly white and slow-setting, except in the case of that with 12 per cent. alumina. They set sharply and hardened well, showing qualities fully equal to those of the best cements. Those which contained 2 and 4 per cent. alumina showed no noticeable heating on mixing with water. That containing 7 per cent. alumina heated slightly, and that with 12 per cent. strongly. This behavior, and also the increased quick-setting qualities with rising percentages of alumina, indicate that the aluminate in the presence of large amounts of silicate behaves in the same manner as when free, and make it probable that the silicate and aluminate of lime in cements are simply mixed and not combined together."

The mixtures made according to the authors' formula all gave satisfactory results in respect to hardening and constancy of volume with from 2 to 12 per cent. of alumina, but the product containing 12 per cent. of alumina was quick-setting and low in tensile strength. On the other hand, the mixtures made according to Le Chatelier's formula all failed to withstand the hot test, and the one containing 12 per cent. of alumina also proved unsound in the cold pat test. It is therefore "evident that the allowance of 3 molecules of lime to one of alumina is excessive, and that the proposed formula in which 2 molecules of lime are assigned to one of alumina is more nearly correct."

Effect of Iron Oxide

The authors also investigated the effect of iron oxide in cement, and Le Chatelier's statement that burned mixtures of iron oxide and calcium carbonate yield products that slake with water and possess no hydraulic properties. In opposition thereto Schott found that the alumina in cement might be replaced entirely by iron oxide without preventing it from setting in water, and prepared a cement containing only lime, silica and ferric oxide, which showed excellent hardening qualities. To test the matter independently, the authors prepared and burned a mixture of pure iron oxide (Fe_2O_3) and calcium carbonate in the proportion of one molecule of Fe_2O_3 to two molecules of lime. The material fused to a black slag, giving a brown powder when ground. On mixing with water to a paste, this powder showed no heating, and did not set or harden in air or cold water; but a pat placed in steam, after standing for one day in air, hardened rapidly and showed no cracking after several hours in boiling water. It thus appears that lime and iron oxide readily combine and yield a product that is constant in volume, but without ability to harden in the cold.

Another mixture was also prepared according to the formula $3CaO, SiO_2 + 2CaO, Fe_2O_3$, containing 7 per cent. iron oxide, but no alumina. The result of burning was a fused black clinker, yielding a dark gray powder. Pats made therefrom with cold water set slowly and became hard, remaining so at 28 days; those subjected to the hot test were sound and hard. "Except in color, the resulting clinker and cement closely resembled that obtained from lime, silica and alumina. It thus appears that iron oxide and alumina act in a similar manner in promoting the combination of silica and lime."

Three other mixtures with varying amounts of iron oxide, alumina and lime were then tested, no lime being assigned to the oxide in the first, while in the second one molecule of Fe_2O_3 received two molecules of CaO, and the percentages of alumina and iron oxide were 4 and 3 respectively; and in the third, which was prepared according to Le Chatelier's maximum formula, one molecule of Fe_2O_3 received three molecules of CaO, with the percentages of alumina and iron oxide also 4 and 3 respectively. The first and second mixtures "gave perfectly sound and satisfactory cements, and no noticeable difference could be observed between them. In tensile strength up to 28 days, the first gave the better result. * * * The cement from the third mixture showed high tensile strength, but failed in the hot test. The pat placed in cold water also left the glass at two days, showing that the proportion of lime was too high."

These tests likewise indicate that iron oxide combines with lime in the same manner as alumina, and from the close similarity in the composition of the first two products, it is evident that in working with ordinary clays which contain very small percentages of iron oxide, it is unnecessary to take this oxide into account in calculating the amount of lime required; also that the effect of ordinary proportions of this oxide in cements is extremely difficult to trace.

Effect of Alkalies

It has generally been considered that the alkalies, potash and soda, aid in some manner the combination of lime with silica and alumina, and hence the addition of such alkalies to materials deficient in them is often recommended in the manufacture of cement. This opinion, however, is not shared by Messrs Newberry and some other chemists. The foregoing experiments prove that pure lime, silica and alumina combine readily without alkalies to produce good cement clinker, and that the fusibility of the clinker depends chiefly on the proportion of alumina and iron oxide present. To test the effect of soda on the combination of lime and silica, however, the authors prepared and burned two mixtures, one

to form $3CaO, SiO_2 + Na_2O$, and the other $3CaO, SiO_2 + Na_2SiO_3$, 5 per cent. of soda being taken in each case. "The results were as follows: 1. Soda largely volatilized; clinker soft, light, infusible; powder heated strongly with water; der did not heat with water; pat set fairly, but swelled and pat swelled and cracked before placing in water; in hot test, pat swelled and soft. 2. Clinker soft, light, infusible; pow- cracked after two days in water."

"It is interesting and rather surprising to note that while the tri-calcic silicate $3CaO, SiO_2$ proved to be of constant volume, though of feeble hardening properties, the same with the addition of sodium silicate gave a product which swelled and cracked. It thus appears from the above experiments that soda is incapable of assisting in the combination of silica with high proportions of lime."

Effect of Magnesia

The influence of magnesia in Portland cement has been a subject of much concern to manufacturers. Several eminent authorities hold that a considerable percentage of magnesia causes cement to expand and crack after long periods. According to Dykerhoff's elaborate experiments, presented to the German Association of Cement Manufacturers in 1895, more than 4 per cent. of magnesia, whether added to a normal mixture or substituted for an equivalent amount of lime, causes a steady decline in the strength of the resulting cement. Actual cracking was observed only with 8 per cent. or more of magnesia. The question is still under careful investigation by the German Association, and hence Messrs. Newberry did not make any experiments relatively to the injurious effects of this substance, but limited their researches to determining its influence on the proportions of lime and clay required to produce a correct mixture.

"If magnesia replaces lime and combines with clay, as indicated by Le Chatelier's formulas, it must be allowed for in the calculation of the mixture. If, however, magnesia is inert, as some have maintained, it may be disregarded, and the clay used may be proportioned to the lime alone. A number of experiments were tried in the hope of throwing light on this question, and though the work is incomplete and not yet conclusive, some interesting facts were brought out which may well be briefly stated."

"Pure magnesia was molded into cakes with water, dried and burned one hour at a white heat. The resulting clinker was much shrunken, brittle and hard to grind. The powder, made into a pat with water, set slowly, was hard at one day and very hard but slightly cracked at the edges after several days in water. Under the hot test, the pat curved and cracked. The same pure magnesia, when burned in a crucible at bright yellow heat, showed only slight hydraulic properties and hardened fairly, but under the hot test it remained soft. It thus appears that this substance, calcined at a high temperature, possesses decided hydraulic properties, but is not constant in volume."

The authors then mixed pure magnesia and alumina in the molecular proportions 1, 2 and 3 to 1, respectively, and burned the mixtures at a white heat. None of them showed any sign of fusing, and the calcined products were in all cases light, porous and soft. On pulverizing and making into pats, there was no tendency to set, nor did they harden in steam. Similar experiments were also made with pure magnesia and silica in the same proportions as before, the mixtures being burned at the highest white heat of the gas furnace. The first mixture (MgO, SiO_2) gave a semi-fused, hard clinker, like porcelain; the second ($2MgO, SiO_2$) gave an incipiently fused, porous and rather hard clinker, and the third ($3MgO, SiO_2$) produced an infusible, porous and soft clinker. The pats made from all the mixtures showed no hardening in air, water or steam. "It may therefore be concluded that the compounds of magnesia with alumina and silica have no hydraulic properties, and it is quite unlikely that they play any part in the hardening of cements."

In certain experiments made by Lunge in 1894 with lime and kaolin, it was found that the silica of kaolin is dissociated from the alumina and rendered entirely soluble by calcining with lime. To determine whether magnesia has a similar power of decomposing clay when calcined with it, the authors mixed 100 parts of clay with 144 parts of magnesia, and burned the mixture at a high heat. The result was a reddish clinker, yielding a pink powder which exhibited no hydraulic properties when mixed with water. On further chemical treatment to ascertain the amount of silica that had been rendered soluble by the calcination, it was found that the magnesia had decomposed only about three-fourths of the clay, and that the action was far less complete than in the case of lime.

The authors also made some experiments to determine whether magnesia should be allowed for in calculating the proportion of clay required for use with dolomitic or magnesian lime. By adding only enough clay, or silica and alumina, to convert all the lime into cement, according to the formula previously given, thus leaving the magnesia free, they obtained a good clinker which yielded a slow setting and apparently sound cement. It is, however, probable that this cement will show expansion and cracking after some time, as indicated by the experiments of Dykerhoff and others. On the other hand, by considerably reducing the amount of clay added to the same dolomitic lime, an unsound cement was obtained.

"It thus appears that the proposed formula is applicable to magnesian materials as well as to those free from magnesia, and that the magnesia should not be considered in calculating the amount of clay required." From the other experiments it was seen that the calcination of magnesia with silica and alumina or clay yields no hydraulic products, and that it probably has no active part in the formation of cement. As to its injurious effects, further reference will be made in another article.

(To be continued.)

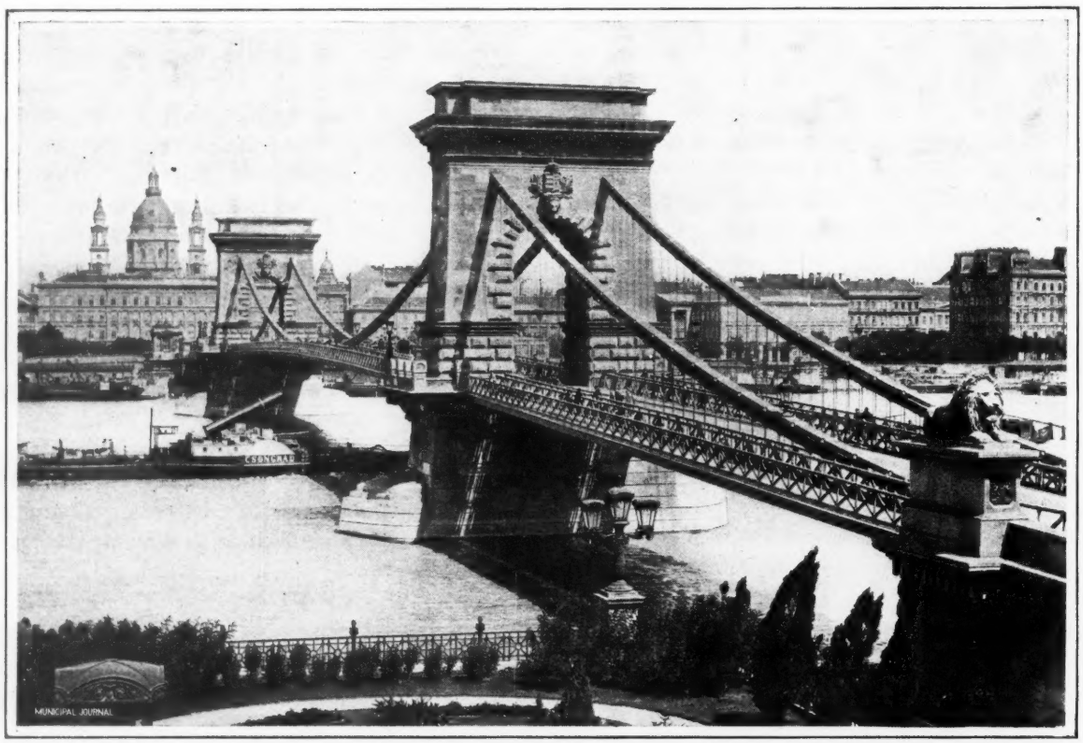
CIVIC ART IN NORTHERN EUROPE*

Transit Facilities—Improvement of Rivers and Harbors—Bridges and Their Approaches—Civic Art Growing

By Milo Roy Maltbie

TRANSIT FACILITIES

The advantages of locations near parks or open spaces and of grouping are so evident that semi-public buildings have been similarly treated, such as cathedrals (near the old market places), theatres, opera houses, banks, and especially railway stations, which need open spaces to accommodate the crowds and which, as vestibules to the city, should be so attractive as to impress the newcomer favorably the moment he sets foot within the city. Instances of effective treatment, often by the use of landscape gardening, statuary and a well arranged street plan, are found in Berlin (Lehrter Bahnhof), Paris, (Gare d'Orléans), Rotterdam (central station), Antwerp (Station du Sud), Mainz, Tours, Rheims, Strassburg, Budapest, Cologne, etc. The railroads appreciate the financial advantage of attractive terminals, and frequently have improved the stations and their surroundings upon their own initiative.



SUSPENSION BRIDGE, BUDAPEST
Eye-bar Cable Construction

Generally the railroad approach to a city is very forbidding whether viewed from the train or from the streets in the vicinity. The presence of tracks or yards usually has such a deleterious effect that the district in which they are is the most unattractive in the city. Partially to remove this ugliness and partially upon purely utilitarian grounds, there has been a strong movement for either the elevation or the depression of the tracks below the street level. The latter is considered preferable, because it removes all noise and dirt and there is no disfiguration of the streets whatever. The advent of electricity as a motive power has greatly facilitated immediate action. Copenhagen is formulating a scheme to place all tracks in the heart of the city underground, to roof over the yards, perhaps laying out a park thereon, to unite the principal stations by subways and to build a central station that shall be artistic as well as commodious. Brussels is considering a subway to connect its two important stations. Paris is extending the underground every year, ultimately to connect all of the railroad stations. Vienna, acting with the Austrian Government, put most of the Stadtbahn underground some years ago and so utilized an old branch of the Danube, which now carries very little water, for the subway that the work was accomplished with comparative ease. There are but few places where the tracks appear above ground, and the central portion of the city is thus spared the evils of a surface or an elevated road.

Where elevated roads have been built within the last few years, strenuous efforts have been put forth to make the structure and stations as artistic as possible. A comparison

* This is the fourth of a series of four articles, comprising the special report to the Municipal Art Commission of New York City by the assistant secretary, Dr. Milo Roy Maltbie, as the result of studies and observations made in the summer of 1903. It cannot fail to have an intrinsic value to all American cities.—[EDITOR.

STATION OF ELEVATED RAILROAD, BERLIN

between the old Stadtbahn, which connects the stations of the steam railroads, and the new electric Hochbahn in Berlin shows how great has been the progress in civic art. An elevated railroad is certain to be objectionable, but the Hochbahn is a great improvement over its predecessors in Europe and America. The curved line is more generally used and ornamental fixtures have been introduced. The route follows a canal for considerable distance, and the trees which border it hide the structure and smother the noise. A few of the stations are quite artistic and add to the beauty of the parks or streets in which they are located rather than detract from it. The structures which carry the steam railroads over the streets of Hamburg are also artistic, and the stations of the underground in Vienna, Paris and Budapest are usually in good taste.

Harbor and River Improvement

The river fronts and harbors of cities, like railroad approaches, are apt to be inartistic, to some extent necessarily so perhaps, because of the nature of the business; but that they can be made attractive has been proved by European cities. In the first place, substantial quays and buildings add very greatly to their appearance. Cologne has a stone embankment and stone quays along almost all of its river front, bordered with a tree-lined street. Budapest has a similar system, except that the street is everywhere very much higher than the quays, and that outside of the trees which line the promenade there is a street car line. The space immediately beneath the tracks and at the rear of the quay, which is 10 to 20 feet below the tracks, is used for storage purposes. This arrangement makes the river front so attractive that it is lined with fine buildings, and a number of public buildings are located there. The walls of the canals of Berlin, of the Siene in Paris, of the water front of Antwerp, of Stockholm and many other cities are built of stone or cement, and in Paris, Berlin and Amsterdam, for example, the banks have been planted with trees which add greatly to their beauty. The substantial brick warehouses upon the quays of Hamburg diminish very much the ugliness of a harbor that does not have many points of beauty.

As already noted, parks and public buildings are frequently located along rivers and harbors, and not only does the water front add to the beauty of the park and buildings, but they make the water front more attractive.

Bridges

Where there are bridges across the river, these are, perhaps, as important factors as the quays and streets adjoining. Berlin and Paris, because of the frequency with which they have bridged the Spree and the Siene, vie with each other for the title of "City of Bridges." All are not artistic and some are very far from it, but the beautiful Pont Alexandre III.—the latest addition to the list in Paris—represents a high standard of civic art and will set the pace for some time. Pont du Carrousel in Paris and the Schloss, Königin, Belle Alliance and Kurfürsten Brücken in Berlin, also are artistic and deserving of notice. These bridges are small as compared with those in Budapest across the Danube, where the city has built a very attractive cantilever bridge—the Franz Joseph Bridge—and a suspension bridge of beauty. Other instances might be cited from Dresden, Vienna, Amsterdam and Stockholm, the best results having been produced where sculpture has been combined with a bridge of attractive lines to produce a monumental structure.

Bridge Approaches

The general effect is so largely determined by the character of the approaches that much attention has been paid to proper treatment at the termini. In many instances there is a large open plaza which serves the utilitarian purpose of affording opportunity for the orderly conveyance or divergence of traffic, which is impossible where the streams all centre immediately at the bridge entrance. It also gives dignity to the structure, and where the portal is monumental or emphasized by the use of sculpture, some space is necessary to give a proper setting.

The plazas at the end of the Norrbro in Stockholm, which carries all of the immense traffic between the old city and the newer district, Norrmalm, on the mainland, the ancient Augustus Bridge across the Elbe in Dresden, the Ober-Main Bridge in Frankfurt, and the Láncz-Hid in Budapest, show

APPROACH TO PONT D'IÉNA, WITH TROCADÉRO AND PARK IN BACKGROUND, PARIS

how important are the utilitarian advantages of the plan. Of course where the bridges are merely the continuation of the streets (Strassen-Brücken), and not the arteries into which flow many streams of traffic, large plazas are not necessary, but some space is always an advantage on aesthetic grounds.

Among the best instances of artistic treatment of bridge approaches are the Trocadéro Park, with its statuary, flowers and cascades at the entrance to the Pont d'Iéna, the Avenue Nicolas II, with trees and grass plots leading upon to Pont Alexandre III., on the north, and the Esplanade des Invalides as the southern approach, the Place de la Concorde north of the Pont de la Concorde, Paris; the beautiful small parks at each end of the Láncz-Hid, Budapest, and the Square d'Avroy, with adjacent boulevards and parks, fronting the Pont de Commerce, Liège.

Budapest is building a new bridge over the Danube, and opposite the approach upon the Ofen side stands the mountainous Blocksberg. High up on the hillside a monument to St. Gellert, who suffered martyrdom here in 1046, has been erected. A few feet below this statue a stream of water will gush forth and tumbling down the rocky side, fall into a pool at street level, thus creating a beautiful vista for the thousands who will throng the bridge. At the other end, the converging point of traffic is two or three blocks from the bridge entrance. This point is emphasized by the erection of two buildings as high as the law will permit, each the reverse (in main outline) of the other. Upon the corner of each building, next to the street forming the bridge approach, there has been constructed a modest tower, but so different from the surroundings as to indicate at once that there is the beginning of the approach.

BANK OF THE DANUBE, VIENNA
Showing Quays, Railroad Underground and Street above

Scope of Civic Art

Civic art concerns itself primarily with the city plan, so as to get the greatest amount of beauty from the union of the fine arts. There are a few matters, however, which might not be included under this head, and yet which pertain to it, as, for example, subjects commemorated by mural paintings for a public building. These are more properly such as belong to the history (real or mythological), life or customs of the city as distinct from other cities. A painting representing Moses in the bullrushes may be just as fine a work of art when tested by all the canons of art as the paintings in the Pantheon commemorating the life of the patron saint of Paris, Ste. Geneviève. But from the point of view of civic art, many maintain that the former would be used to adorn a city hall with as much propriety as a painting of a bull fight to decorate a modern church. As harmony is one of the fundamental canons of art, it is argued that it should apply to subject as well as to composition, but this is not universally admitted. European cities have not universally followed this rule in the decoration of public buildings. The Paris Hôtel de Ville, generally considered one of the best decorated public buildings, has mural paintings representing hunting, botany, eloquence, philosophy, etc. These are not, it is quite generally admitted, what one would most expect to find there, nor do these receive the attention or approval by those who visit the city hall that is given to scenes from the history of Paris, or of the great men who have moulded the life of the metropolis. And, generally speaking, by far the greater majority of paintings and statuary in the municipal buildings of Europe relate to the history, life and customs of the city in which they are located, and the trend is strongly in this direction.

To cite a few instances: The City Hall of Copenhagen, now nearing completion, bears the impress throughout of Copenhagen life, and here is hardly a decorative feature in the structure that does not relate to that city alone. Its history, its industry, its commerce are commemorated, and the artists seemed to have found ample opportunity for the exercise of their ability. The same is true of the City Halls of Hamburg, Berlin, Vienna, Munich and many others. The Hôtel de Ville of Brussels has, among other things, tapestries representing the artisans whose guilds formerly ruled the city. Antwerp revels in historical paintings; there is little else.

It is hardly necessary to add, after citing instance upon instance of civic art, that the movement has a firm foothold in European cities. There is no discussion of its merits; these are taken for granted; the question was long ago settled, if it ever was mooted. Everything now centres about the question: What are the most effective methods of beautifying cities? That, too, is coming to be the situation in the United States, and rapid progress has been made within the last few years. In one direction particularly do we have the advantage. In Europe the attitude of the citizen toward the city is that of dependence. The attitude of the city toward the citizen is that of independence. But in American cities the attitude of each toward the other is that of interdependence. The highest results can only be attained by mutual co-operation, city officials with citizens and citizens with city officials. This is generally lacking in Europe.

THE END.

BRICK AS A PERMANENT PAVEMENT*

Specially Adapted to Certain Streets—Better Than Asphalt—Easily Repaired—More Durable and Always Sanitary

*By W. E. Gunn, C. E.**

In the selection of material for the improvement of city streets, no fixed rule can be laid down that one kind of material is the best that can be obtained, superior to all others. Such a statement would be mere prejudice. Many subjects bearing on the construction of each street must be considered. The size of the city, the present and probable future travel on the street, the grades that must be encountered, the class of property along the thoroughfare, the relative cost of different materials in that particular locality—each of these has its bearing.

In a fine residence district of a large city, where the matter of first cost, and cost of cleaning, would have little weight, compared to securing a noiseless street suitable for fast driving, creosoted wood block or asphalt might be well considered the best selection.

In a park, or for a lightly traveled suburban street, macadam or gravel would be regarded as equally suitable.

In like manner, a street in a manufacturing district, subject to severe travel, could be best taken care of with granite paving, while the ideal path for the sport of kings, is natural soil, as illustrated at Morris Park, Hawthorn, Saratoga or Latonia.

Each material has its advocates and its arguments, its real advantages and disadvantges—its own field of use.

In cities of medium size, brick streets, for economy and general utility, are better adapted than any other material. Such cities, say from 15,000 to 150,000 in population, as a rule, are not extremely wealthy, and do not have the most severe travel to provide for. They must, therefore, select a material of sufficient strength and durability for the local needs, and take careful thought of the first cost of the material, as well as the cost of cleaning and repairing. The principal streets of such towns, if left in the macadam with which they have usually been first paved, become an expensive nuisance, intolerably dusty in the summer and unspeakably muddy in wet weather.

Street Re-Construction Becomes a Necessity

As to first cost, brick paving may be estimated at $1.75 per square yard, including cost of concrete foundation. Asphalt will cost perhaps one-third more. After the period of guarantee has expired, the asphalt street will cost during the remainder of its life from five to ten times as much to repair as a brick street. Asphalt also costs fully three times as much to clean as brick.

On certain days in the year, when fine weather prevails, asphalt presents a delightful appearance, but if the weather is wet, it soon gets a slimy appearance, and in very dry, windy weather, a fine, disagreeable dust comes from the surface of the street that in the nature of things, must be unsanitary. It has the further disadvantage of being very slippery in freezing weather. It is not a superior street for hauling or for fast driving, though it equals brick in the latter respect. It has a tendency to roll and gather in lumps, leaving depressions in the surface. In very hot weather, it is soft enough to sink under heavily loaded wheels, producing the effect of hauling up a grade, even on a level street.

The local experience has been that the livery stable owners, teamsters, and all persons interested in constant use of the streets for hauling, prefer brick streets to asphalt.

A serious objection to the use of asphalt, is the fact that a city of medium size cannot afford the expense of maintaining its own plant for making repairs.

The existence of the Asphalt Trust and its manipulations of the supply of material, has, in the past, been detrimental to the use of asphalt. There always has been more competition for supplying brick than asphalt. Almost any city can find home labor sufficiently skilled for making all necessary repairs for a brick street, which is a desirable feature in the use of brick, and the fact that home labor cannot repair asphalt is an objection to its use.

The material for brick paving can be readily examined and inspected to prevent the introduction of brick inferior to the requirements of the specifications and contract. The inspection of asphalt is much more difficult; it is the work of a specialist.

Brick More Durable Than Asphalt

A further argument for the use of brick is its durability. The life of a brick street, before it needs repairing, is certainly of greater length than asphalt. As compared to asphalt, brick is therefore, in all ordinary cases, to be preferred.

Creosoted wood block paving promises a street superior to asphalt, but its cost, which is about two-thirds more than brick, prevents its use from becoming general at the present time.

In stating that brick is most suitable for medium sized cities, I do not mean that it should not be used in villages and large cities, but that its judicious use is proportionately greater in cities of medium size.

Assuming that brick has been adopted as the material to be used, let us examine what is at present good practice in laying brick pavements. At the present time, the brick generally used are three inches wide by four inches deep by eight inches long. The foundation of the street is composed of about six inches of concrete. On this is placed a sand cushion of one and one-half to two inches. The brick, after being laid in place, are rolled to a true surface, which produces a very much smoother and more perfectly formed street than was formerly secured by ramming. The street is then completed

* Mr. Gunn is the City Engineer of Covington, Ky., and has had much experience in the construction of all kinds of pavements, which adds value to this paper, read before the recent session of the National Brick Makers' Association at Cincinnati.—[Editor.

by filling the joints with a rich grout composed of equal parts of Portland cement and fine sand. At intervals of about twenty-five feet, three or four joints are filled with tar to provide for expansion. It is possible that the joints could be more perfectly filled by brushing the mixture of fine sand and cement into the joints dry, instead of in the form of grout. The use of cement instead of tar is a very material improvement. When the joints are thus filled, the paving acts as one piece. The street remains smoother and this decreases the noise, and is bound to add to the durability of the paving. A tar filler at certain times of the year becomes soft. Each brick can then go down separately. The paving becomes, to some degree, rough and, therefore, more liable to wear.

All tracks for street railway service should be laid with six inches of concrete under the ties. The use of grooved girder rails makes the least objectionable track for street purposes.

It is customary to limit the absorption of brick in specifications for street building to two per cent. This requires the use of a shale brick, and while the writer's experience favors this kind of material, the 2 per cent. limit is rather narrow. There is no connection between absorption and the ability of brick to stand an abrasion test unless the absorption is more than 2½ or 3 per cent.

The best wear of brick in the street, is not confined to brick that absorbs less than 2 per cent., though some of the best wearing brick are within the limit.

In order to secure the most satisfactory results in street building, it is very important to have all sewer, gas and water pipes laid before the street is built. It is almost impossible to repair the surface with its original perfection if cut open after completion. Medium sized contracts usually secure better competition and more advantageous prices than very large or very small contracts. All material and work should be guaranteed for a sufficient length of time to demonstrate its good quality.

A most important feature of securing an attractive street is to build good and uniform sidewalks at the same time.

Streets, carefully built and honestly inspected, as outlined above, will give good results in use, and will add to the value of the adjoining property. Their cost is reasonable, and they will give satisfaction to the citizens.

PURIFICATION OF WATER BY OZONE

A Chemical Process Requiring No After Treatment—Frees Water from Bacteria and Iron —How It Is Done

DR. ERLWEIN, of Berlin, speaking on this subject at the forty-third annual meeting of the German Union of Gas and Water Engineers, began by a preliminary division of the natural waters to be treated into deep and surface waters. The former protected from contamination by the latter by impermeable strata of clay, and after passing through great thicknesses of sand, has been so filtered that it is practically free from bacteria, and requires no purification, except it may be from salts of iron. The reverse is the case, however, with surface water. Water from lakes and rivers, and all water which has never traveled underground since it has fallen as rain, invariably needs purification both from suspended organic matter and from pathogenic bacteria.

The processes for the purification of water may be classified under the following five heads: (1) Mechanical, (2) chemical, (3) mechanico-chemical, (4) thermic, (5) electrolytic.

The last three require little notice. The mechanical methods resolve themselves practically into filtration, and this on a large scale is always done by sand. The proper action of such a filter depends upon a supposition which is not always realized—viz., that mud layer which forms on its surface, and is the real bacteria filter, should remain unbroken. The realization of this essential condition requires careful management and supervision.

The purely chemical purification methods can be subdivided under two heads; the older processes and the ozone process. The former consist of sterilization by chlorine and other powerful reagents, the quantity of which to be used was difficult to determine, and the unavoidable excess of which had to be removed from the water before it could be drunk.

The ozone process necessitates no such after treatment, as the excess of the sterilizing agent decomposes spontaneously. Ozone is not only a bactericide, but frees water so perfectly from iron that it may well be used for that purpose alone.

As regards ozone and its preparation it may be remarked that ozone is an active modification of oxygen, of peculiar odor, and lightly soluble in water, where it kills the bacteria and burns the dead organic matter. In burning this matter it becomes converted into ordinary oxygen. Ozone may be prepared either chemically or electrically. The latter is the only practical method on a large scale, and consists in subjecting oxygen, or air, to a silent electrical discharge, in apparatus of various construction. The air or oxygen, best freed first from water vapor, is driven at low pressure through a space filled with the blue brush discharge. The ozone is then brought into contact with the sprayed water in a tower.

Dr. Erlwein proceeded to explain the ozone process as carried out at Wiesbaden and Paderborn. Paderborn may be regarded as the most typical example. The plant there has provided the whole of the drinking water of the town for nearly a year. It was built by Siemens & Halske for an hourly yield of sixty-eight cubic meters. It consists of a direct current dynamo, centrifugal pumps, a transformer, and a blower, all driven by one gas engine. In a separate room is a battery of nine ozone apparatuses, and there are two sterilization towers. The ozone apparatus are of the

Siemens tubo type, in which the electrifying space consists of a glass cylinder with an internal metal cylinder. Such an apparatus, working at about 8,000 volts, requires one horse power, and delivers from 240,000 to 480,000 liters of sterilized water per twenty-four hours.

The sterilization towers are of concrete, and four meters high. The water in them trickles down over pebbles, and meets the ozonized air coming up from below. The pebble bed is two meters thick, and is supported by an iron grating. It is fed with water by a four-armed sprinkler; the internal section of each tower is one square meter, and through it pass per hour fifteen to twenty cubic meters of water, and thirty to forty cubic meters of ozonized air. The air passes from ozone apparatus to tower and back again in continuous circulation, an inlet being provided to supply what is consumed. The ozonized water from the Paderborn towers escapes from the collecting reservoirs in thin cascades, to allow the escape of the ozone, which takes rather longer with Paderborn than it would with a less pure water. It will be seen that the old method of forcing ozone into lofty columns of water has been given up for such waters as that of Paderborn; but the high-pressure system is, perhaps, best for many ferruginous waters. Precautions are taken to cut off the water supply to the towers in case of any accidental interruption of the supply of ozone. Great care is taken, too, to protect the attendants from the high voltage used.

The Wiesbaden apparatus is almost exactly like that at Paderborn. It was designed to purify 250 cubic meters hourly, and is divided into two independent halves, one of which is reserved for seasons in which the consumption of water is heavy. The motive power consists of two sixty horse-power steam engines driving the direct and alternate current dynamos, the pumps, and the blowers. Each half of the plant comprises twenty-four ozone apparatuses with their transformers, and four towers, one of which is kept in reserve. As in the case of Paderborn, the plant was designed for a water free from iron and suspended matter, but it was known that iron might occur, and it did later, the outflow from the tower becoming yellow. But the consumption of ozone was not markedly increased, and the sterilization remained perfect. The water now contains so much iron that it must be filtered after leaving the towers. As usual, the presence of iron in the water is unfavorable to the existence of bacteria.

Dr. Erlwein next described the Siemens experimental ozone water purifying works at Martinikenfeld, which has served as a model for the commercial installations. It consists of three parts—a rapid filter, an ozonizing plant, and a sterilization tower. It is constructed to purify ten cubic meters hourly, and has purified the foul water of the Spree with conspicuous success. It has been thoroughly tested with Spree water full of cholera, typhus, and other disease germs, artificially reared and added to the water. The result was to prove that the ozone treatment killed all the disease germs, even when in greater numbers than are present during epidemics.

As regards the chemical effect of the ozonization of water, it diminishes the oxidation degree of the water by 15 to 25 per cent., and increases its content of free oxygen. The ozone reaction vanishes a few seconds after the water leaves the tower, and no taste is given to the water.

The expense of ozone purification depends chiefly on whether filtration is or is not necessary.

Out of Germany other systems of ozone sterilization than that of Siemens are employed. Of these, the most important are those of Tindal, Abrahams-Marmier, Otto, and Vosmaer. They differ from the Siemens process partly in the construction of the ozonizers, and partly in that of the sterilizers, but these are not used except on a small scale, and their exact details have not all been made public.

In conclusion, Dr. Erlwein remarked that the use of ozone is out of the question when a good surface water can be had cheaply. At present this is often, but not always, the case. The ozonization process, too, should not cause forgetfulness of the immense services which the sand filtration of water has rendered to sanitation, in spite of the unquestionable efficacy of ozonization in killing all pathogenic bacteria, while sand filtration does nothing more than diminish their number. The ozone process must always be taken seriously into consideration where difficulties arise in large towns as regards extending already existing filter beds or making new ones, when they may need the acquisition of land at heavy expense. The ozone plant is also excellent for places where it is impossible to rely too much on the waterworks staff. For this reason alone various colonial authorities are seriously considering water purification by ozone. There are cases, too, in which iron and organisms giving taste and smell to the water can only be removed by ozone. In short, every case must be judged independently for the determination of the most suitable system, or combination of systems, for purifying the water.

SEWAGE DISPOSAL PLANT FOR CLEVELAND

After discussing the typhoid fever situation in Cleveland, O., the Board of Health of that city has gone on record as absolutely opposed to the filtration of the city's water supply, favoring a sewage purification plant instead. The examination of the city's water by Dr. Howard, which purported to show that the typhoid danger was very threatening, was not sustained by the examinations of experts outside the city, to whom were sent samples of water every week. These examinations showed that the water at the intake was almost pure. Dr. Rosenwasser, president of the Health Board, at a meeting of the same, presented a paper which stated that the plan to spend $2,000,000 for a water filtration scheme was premature and immature. The best thing to do, in his opinion, is to secure the best system of sewage disposal and so prevent any filth from getting into the source of the city's supply. The Health Board adopted its president's suggestions in regard to a sewage disposal plant. It has been found on examination that more than half of the spring water purchased by the citizens for drinking purposes is bad.

RAIL JOINTS AND PAVEMENTS*

Old Methods of Track Laying Superseded of Necessity to Meet New Conditions—Modern Methods of Welding Rail Joints

By C. R. Van Buskirk

EVER since railroads were first introduced in the country there were, of necessity, rail-joints, but these joints were made with only two objects in view. One, of securing the rails in such manner as to prevent any longitudinal motion, except for the allowance of expansion and contraction, and the other to secure the ends in such a manner as to prevent any lateral or vertical motions.

LATERAL MOTIONS OF RAILS

It is the latter movements which we are to discuss principally, as their actions cause the main, and, I might say, the only troubles which harass the municipal engineer in his dealings with streets, and the rail-joints in their relation to pavements.

Rails are put together and kept from moving apart by two pieces of metal, called fish-plates, one on either side and bolted, and the result of this particular part of track laying is what causes in a great measure the disturbance so disastrous to pavements, and while it is more noticeable in some than in others, still the trouble can be discerned in all kinds of pavements, and more particularly in the asphalt pavement of the present day. Concerning the first object, we have very little to discuss or enter into, for in the putting together of the rails they are bolted together in order to prevent any motion longitudinally except that allowed for expansion and contraction, caused by changes in temperature, which in this vicinity amount to an average of 110 degrees, according to the official reports of the weather bureau of New York City; to admit of this the holes in the plates are punched elliptical in shape, which allow the rails to expand or contract without cutting the bolts joining the fish-plates and rails together, this applies to exposed rails as on steam roads or on streets without any pavement, or with old cobble pavement; the change in the length of the rails, due to expansion and contraction for 110 degrees variation in temperature are three-sixteenths of an inch for a 30-foot rail and three-eighths of an inch for a 60-foot rail, the latter being the only rail now laid in the Borough of Brooklyn. On account of the friction of pavement and rail it is conceded by the best authorities that where the pavement is laid on a concrete foundation or even granite blocks on a sand foundation, provided the blocks are close together, there is no longitudinal movement of the rails, for although there is a tendency to do so, yet the strain is taken up by the rail itself.

The old Nassau Railroad Company, which became a part of the Brooklyn Rapid Transit Company's system in 1893, probably furnished the only case where the longitudinal movement of the rails caused any trouble in the pavement in this city. The case quoted was the result of the company's desire to give an easy riding road by making a track without any joints, theoretically, and the process of welding was instituted which made the various rails one long rail.

TWO PROCESSES OF WELDING

The processes of welding were of two kinds, electrically welded and cast welded, the latter being known as the Falk patent. The method of electrical welding consisted of joining the rails together and applying an electric current, which caused the two rails to fuse together. This was found by the Johnson Company, which built the Nassau system, to be very expensive, and, therefore, was temporarily abandoned, and the cast-welded joint was substituted in its place over the greater portion of the entire system.

In the cast-weld, a mould was placed around the ends of the abutting rails, the ends having been first cleaned by a sand blast, in order to remove all scale and rust, leaving the surface clean and bright and in perfect condition for amalgamation, and molten iron was taken from a portable cupola and run from this into ladles and poured into the mould by the workmen; in both of these no electric bonds were needed.

Whether the question of temperature never entered in their calculations or not is hard to tell, but this fact remains, that as the work was done in cool weather, as soon as the summer came the rails buckled in such a manner as to displace the pavement and bring the first point in our discussion into prominence. When the winter came and the rails once more came back in their place there were holes, caused by the buckling of these rails. This occurred only in the cobble-paved streets and on streets where there was no pavement. On the granite-paved streets it had no effect, proving the statement made previously.

In the movements now before us for discussion we have the joint exclusively to deal with, and it brings us to the second point in our discussion, and the main one in which we are interested; this joint and its relation to pavements, totally regardless of the length of the rail, its size, depth or any other dimension, it is the joint only which we are interested in and which has given the city engineer all the trouble.

FIRST EXPERIENCE IN BROOKLYN

When the first rails were laid in our city little thought was given to the joint other than to its usefulness in holding the rails together and to prevent the motion previously cited. There was no pavement which was ruined by the joint, nor which would cause the engineer on municipal work any uneasiness, for in most cases, and I might say all, there was either cobble-stone for the pavement or the earth itself, neither of which had any impression made upon it by a loose joint or one where one rail was lower than the other, causing a pounding which eventually loosened the joint. None of these different faults, however, caused any uneasiness to the city engineer, but only to the railroad companies themselves,

* A paper read before the Brooklyn Engineers' Club, Feb. 11, 1904.

until the new and improved pavements began to come more and more into use on streets where car tracks were laid, and with it came the question to the railroad companies as well as to the city engineer, what fish-plate is there which will reduce, if not prevent, the lateral and vertical motions of the rail and the pounding at the joint, and by so doing preventing the wear of the pavement.

We find the trouble making itself manifest principally in the asphalt pavements, although it occurs as well in other pavements, but not so disastrously. The Brooklyn Rapid Transit has tried many methods to obviate this trouble, but have had failures with all, more or less, until the Weber joint came upon the market. The construction of the Weber joint admits of the even distribution of all shock and movement at the joint, and, being a base support joint, prevents low or dipped rail ends, and thus does away with the pounding at the joints, which ultimately destroy the pavement around the ends of the rails, more especially the asphalt pavements. This joint is designed with sufficient strength but does not produce excessive stiffness or rigidity, and is not only as strong as is the normal rail at the center and quarter but is also as elastic. Otherwise it would wear the rail and make a hollow at the joint, for this defective quality causes a joint to become a hard spot, or it might be likened to an anvil, where constant pounding will flatten the rail, and cause excessive wear of the rolling stock and a poor riding track.

In the Weber rail-joint there is an angle called a shoe-plate, on which the two rails rest to give the rail an even bearing, and in the comparison of the angle-bar with the Weber joint we do not find it strange that as angle-bars have but about one-third the strength of the rail 30 per cent. to 50 per cent. of the track labor is concentrated at the joint where the angle-bars are used in the endeavor to maintain surface and line and secure to the rail a uniform wear. Between the angle-iron and the joint-plate is placed a piece of yellow pine wood, full of resin, which serves as a filler. Naturally the moisture from the earth and atmosphere soon begin to get in the wood filler, and it commences to expand so that the plate and bolts are under a constant strain, and as the wood filler, which does not decay, being under constant compression and practically enclosed in steel, preserves a tension in the bolts which prevents any movement in the parts. It can be readily seen that this expansion of the wood prevents any looseness in or around the plate and forms a joint which is absolutely tight, which prevents any sag at the joint ends, prevents any lateral or vertical motions, and, above all, makes a joint against which asphalt pavement can be safely laid.

Later Improvements in Welding

Since the Nassau Railroad Company introduced into this city the process of welding a great many improvements have been made by the Lorain Steel Company in electrical welding. The present method of electrically welding rail joints, as applied by the track welding department of the Lorain Steel Company, comprises three distinct operations. The first is that of sand blasting, by means of which all dirt, rust and foreign matter is removed from the rails at the points where the welds are to be made and from the bars used in making the joints. The apparatus for this work consists of a 10-horse power motor driving an air compressor, a tank for the storage of air and a bin for holding a supply of sand. By means of a hose and nozzle the operator directs the blast of air carrying the sand to the rail until all foreign matter has been removed. The bars are similarly treated, and the joint is ready for the actual operation of welding.

The apparatus for welding is carried in two cars, coupled together by a special form of slip coupling, which permits of sufficient range of movement for the car carrying the welder proper to be moved from one weld to another of the three welds necessary in making a joint without the necessity of moving the second car. The welder itself is hung from a bail on a crane extending out beyond the end of the car. This crane permits of lowering and raising, so that the jaws of the welder can engage the side of the rail, and also the shifting of the welder from one side to the other to engage both rails of the track. The crane is operated by friction clutches from a shaft in the car, which is kept running continuously by a five-horse power motor. This motor also drives a small rotary pump for circulating water through the welding transformer and the faces of the contacts to keep them cool. After the water has passed through the welder it goes to a cooling tank on top of the car, which has a false bottom, and air, from a blower in the car, is forced under the false bottom and upward through numerous holes into the water, thus forming a most efficient method of cooling. The welder itself is an alternating-current transformer, on each side of which and supporting it, but insulated therefrom, are two large levers, hinged together at about two-thirds the distance from the top, for transmitting the necessary pressure to the weld. These levers are connected at the top by an hydraulic jack. A hand pump for forcing water into the jack is bolted to one of the levers. A pressure of 4,100 pounds per square inch is obtained on a 3⅞-inch diameter ram of the jack, the leverage on the arm increasing this so that about thirty-seven tons pressure is developed at the weld.

Present Methods of Welding

In making a joint, flat rolled steel bars are used, having at each end a boss or projection on one side, which forms the contact points between the bars and the web of the rail and confine the weld area to these sections. A flat strip of steel, ⅛ inch thick by one inch wide, is placed across the middle of the bars on the same side with the bosses. The bars are supported on small blocks and placed across the joints so that the middle strip engages the web of both rails. The middle weld is a vertical one, and made the full width of the bar, the end weld a horizontal one.

The welding train of two cars is moved up to a joint, and the welder is thrown into place and the paws made to press against the bars at each side of the rail. The current is then turned on and flows from contact to contact through the bars and the rail web. By alternating the pressure on the jaws the resistance of the junctures is increased and the whole is soon brought up to a welding heat. As soon as this point is reached the current is cut off, and simultaneously the pressure is brought up to the full amount. The pressure is then loosened, and the welder car moved back to bring the jaws opposite the extremity of the bars. The same process is again followed here, except that when the final pressure has been applied it is held there and the weld permitted to cool under pressure until the metal has cooled sufficiently not to

show any glow. The welder is then moved forward to the other end of the bar and the process repeated, after which the welder is raised and moved to the other side of the car to engage the opposite joint.

By holding the pressure after the weld is made a remarkably tough weld is secured. It will be noted that only the end welds are thus treated; as the center weld is not subjected to any strain it is not essential to have toughness there. It has been found desirable to weld the ends of the bars while the bars are in an expanding state. By making the center weld first and not stopping to cool it under pressure the greatest elongation of the bars is secured. After the ends are welded and the bars cool off they shrink and exert a powerful pull to bring the abutting rail ends together, thus closing the slightest opening and leaving practically no joint at all. This is an important point in the manufacture of a continuous rail, for if the abutting rail ends are not brought firmly together the metal in the head of the rail will have a chance to flow into the opening between the rails, and this in time will cause a low spot in the head of the rail. As the bars are always in a state of tension it follows that the rail itself, enclosed between the bars, is in a state of compression. Any construction of the rail itself between the joints will be transmitted to the end welds, and it is, therefore, necessary to have these welds exceedingly tough to withstand the strain. The object of the center weld is simply for vertical stiffness and to prevent any movement of the rail ends.

In the car coupled to the welder is carried a rotary converter for changing the direct current from the trolley to an alternating current. The third and last operation in the process consists in grinding the head of the rail to a true surface. In welding new rails there is little need for this tool, but in old track, where the rail ends have been battered, the receiving rail is purposely welded higher than the other. The grinder is then used to grind out the inequalities in the rail head and bring it back to a true surface. The grinder consists of an emery wheel mounted on a carriage having two rollers, which are about 4 feet apart. This carriage is let down on the rail so that the rollers pass along the head of the rail, the emery wheel being over the uneven portion at the joint. The carriage is connected with a motor on a car by a swing frame, thus enabling the operator to move the emery wheel back and forth over the joint while the car remains stationary. By means of a hand wheel the emery wheel is gradually fed down, and as it is moved forward and back it grinds off the high places until the whole joint is brought to a true surface. The principle is very much the same as a carpenter's plane.

Carried on as a continuous process, it takes from twelve minutes to fifteen minutes to complete a joint. About eighty joints can be made on an average in twenty-four hours, or a mile of single track of 30-foot rails could be welded in about 4½ days, at a cost ranging between $2,000 and $2,500, or in the welding of the 60-foot rails now in use the work could be done in about 2¼ days, and at a cost of $1,000 to $1,250. The bars used are 1 inch x 3½ inches and 1⅛ inches x 3 inches, the length varying with the form of joint previously used. On new rail, where the ends are left without any drilled holes, especially for welding, the length of 18 inches, while on old rail the bars must be long enough to reach back of the old bolt holes, and in some cases requiring bars as long as 48 inches.

This method of joining the rails together is to be instituted during the coming season by the Brooklyn Rapid Transit Company, and as the rails are made one long rail there can be no sag at the joint, and hence no wear of the pavement, and the cause of trouble to the municipal engineer will be lessened, if not removed entirely, by the use of either the Weber joint or welding by the method just described.

GARBAGE DISPOSAL AT LYONS

In the city of Lyons, France, no especial means have ever been employed for the disposition of garbage. The inhabitants of the city generally live in apartments. They dump their garbage into large tubs which are placed in the entrance to the building and which, when full, are left on the curb of the street to be carried away in carts that call daily before 10 o'clock A. M. The contractors, who carry off this garbage, are free to do what they please with it. The work costs the city annually about $55,633.80.

The streets of Lyons are swept three times per week with heavy hickory brooms. They are washed daily with water driven from hydrants through a long hose. The water is thus squirted into the cracks between the stones, and whatever refuse may remain after the sweeping is thus drained off into the sewers. All the work of cleaning the streets is done by manual labor, no machines being used.

The two rivers Rhone and Saône flow through the city, and the waste water from the apartments is carried off into one of them by sewers, according to the proximity to one or the other of the streams.

The exact cost per cubic foot or per ton of removing and destroying garbage is not known. In Paris, where the garbage was burned, the entire operation—removing, interest on plant at 2 per cent.—costs 48 cents per ton. The rubbish generally receives the careful attention of ragpickers and, after it has been conveyed to the incinerator, a number of ragpickers are authorized, as a special privilege, to go through the mass of débris and appropriate what they found, such as bits of tin, sardine boxes, fruit cans, corks pieces of glass and bottles, scraps of paper, wood, etc. All the scraps thus rescued from the incinerator find ready purchasers—the tin and solder remaining on the tin are used in the manufacture of toys for children; the corks are ground up and reconstructed into cork bark or are sent to linoleum factories. The work of picking over the rubbish for salable things will hereafter be confined to employees of the city.

GOOD ROADS MEET AT ERIE

THE first general meeting of the New York and Chicago Good Roads Association was held at Erie, Pa., March 16 and 17. Prominent good roads advocates were in attendance and a number of good addresses were made. After Col. Albert A. Pope, president of the Association, had called the convention to order, Mayor William Hardwick addressed the delegates, welcoming them to Erie. Col. Pope then delivered his address, taking as his theme "Transportation." He said in part: "The highways are the natural feeders to railways, and improvements on them materially increase both interstate and international commerce. If our government has seen fit to be liberal in river and harbor work, it is reasonable to expect that the building and maintenance of public highways should demand the same attention. There is an interdependency here acknowledged by those who analyze this question aright; but even when the national government contributes toward the promotion of good roads, I believe that the cities, counties and townships should bear their proportionate part of the expense. It is not only a safeguard in the disbursement of funds from the public treasury, but it insures better work and a more widespread interest. * * * Could the farmer, at all seasons, draw his produce to the nearest shipping point, he would use his own time to better advantage because he would do this drawing in dull seasons and the rolling stock of the railroads would be far more effectual, because a steady supply of freight would, in a measure, do away with the congestion of traffic which happens from time to time, and which is a source of great loss to all concerned."

Col. Pope introduced Senator Latimer from South Carolina, who spoke on the aid of the national government in road building, showing the saving to the farmer if good roads led from his door to the railroads.

The next speaker was Frank Z. Wilcox, vice-president of the National Good Roads Association, whose topic was "National Aid Necessary in the Construction of Continuous Lines of Improved Highways." He pointed out that no road could attain to its greatest usefulness until it had been improved its entire length. He protested that too much time had already been lost in parleying and the government should at once put in operation a system for road building in connection with the States, that would result in long continuous lines of highways.

Hon. Horatio S. Earle, State Highway Commissioner of Michigan, took as his subject "The Value of State Aid for Continuous Lines of Improved Interstate Roads." He did not consider the proposed line of roads from New York to Chicago class legislation, as 10,000,000 people would benefit by it. The last address of the sessions was by Hon. George McCann, of Elmira, N. Y., who spoke briefly on what his county had done in road work.

The first speaker at the second session was Frank D. Lyon, special examiner of highways, Albany, N. Y., who represented State Engineer Bond. Hon. Joseph W. Hunter, State Highway Commissioner of Pennsylvania, who spoke about the progress of the good roads movement in his State, and a number of other gentlemen made brief remarks.

Resolutions were passed favoring the proposed road connection between New York and Chicago.

At the last session Col. W. L. Dickinson, of Springfield, Mass., second vice-president of the Association, delivered an address on continuous lines of interstate roads built by co-operation between the national government, States, counties and towns. Street Commissioner Charles W. Ross, of Newton, Mass., was not able to be present, but sent a paper that was read by the secretary, Arthur H. Battey, of New York City. The following extract from his paper has been selected: "We have many miles of State roads leading across the State, where one section man can be given from four to six miles of street to care for and keep in good condition all the year around. Of course there are times in the winter when there is nothing to do, but I believe by this system of caring for streets a man should be on the ground almost every day in the year, when the streets are not covered with snow. It is more essential for the men to be on duty on stormy days than at any other time for the drains require opening and he can easily remove the leaves and dirt which clog the catch-basins, and he can guide the water into the proper channels. In this way a man can do more good than on a fair day. The old adage always proves true—'that a stitch in time saves nine.' A load of fine crushed stone on the surface of a road on a rainy day will do more good than twice the amount when the road is dry.

"One of the best methods of caring for the streets, I think, is to put the steam road-rollers at work as soon as the frost is out of the ground in the spring, while the ground is soft. In this way the streets can be rolled and the stone pushed down, the fine material coming to the surface. The action of the roller going over the road when it is wet and the subgrade soft, is much the same as the tamping of concrete. The fine material is floated to the surface and the coarser material is driven down out of the way of the wheels. If the roads are properly rolled early in the season, about half the summer's work is done."

At the banquet following the convention a number of speeches were made, remarks being made by Secretary Battey and Commissioner Earle.

MUNICIPAL JOURNAL AND ENGINEER

Published Monthly by

THE MUNICIPAL JOURNAL PUBLISHING COMPANY

253 Broadway, New York

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TERMS OF SUBSCRIPTION

(Payable in Advance)

United States and Canada	$3.00 per year
Foreign Countries	3.00 "
Single Copies, each	.25

Special rates given for clubs of ten or more.

Make all checks payable to The Municipal Journal Publishing Company

Entered at the New York Post Office as second-class matter

NEW YORK, APRIL, 1904

The Growth of Municipal Art

Of the fifteen hundred municipal associations in the United States, none has wielded as great an influence for the embellishment of the city, the town, the village, as the Municipal Art Society of New York. Its fields of usefulness have spread beyond the confines of Greater New York, as not only were the larger cities quick to follow its lead in the organization of similar societies, but the towns and villages also have done likewise. Its members, at one time or another, have visited nearly every State in the Union and given addresses upon various phases of the subject, as related to the conditions in some particular locality. It not only led in the matter of organization, but was the first to propose and hold a Municipal Art Exhibition three years ago. The third annual exhibit was held in the galleries of the National Arts Club last month and was more successful than its predecessors. One of its members was the first to propose the installation of a Municipal Exhibit as a part of the Pan-American Exposition, at Buffalo, which failed for lack of Exposition funds. Then, three years ago it made a suggestion to the authorities of the Louisiana Purchase Exposition, to install "The Model City Exhibit," which, after much discussion was adopted in modified form.

Mr. Frederick S. Lamb, formerly secretary of the Society, was the principal speaker during the last annual exhibition, and, in referring to the growth of the idea, pertinently said:

"It has been recently stated that when all is said and done, 'It is the extent of man's capacity for ordered co-operation that measures the progress of the race from one to another vantage ground of culture.' It is is this necessity for co-operation that is one of the chief charms of the municipal government. Private art, selfish art, individualistic art, with all its eccentricities and mannerisms, has run its race. The world at large is nauseated with the repetitive statement of bombastic personality, and has turned with a sigh of relief to those art creations, which studied and restricted, if you will, by municipal considerations, are rapidly coming to the front. The only art produced to-day which will live and be cherished by future generations is that which might be called poetic, on the one hand, or utilitarian on the other. The impertinence of the gilded frame, the arrogance of the limited edition, the snobbery of the remarqued proof, have reached the limit, and it is pleasing to record that a reaction is taking place, and that public art, monumental art, municipal art—or whatever you choose to call it—is almost the only art expression which is being ranked as really worth while.

"An able man, a close student of sociological conditions has recently stated that if municipal development in this country is to follow the lines of foreign precedent, then must this country indeed be in a pitiable condition. There is more truth in this statement than one cares to admit. If our form of government, which we consider the most advanced in the world, is to produce results no better than those produced in the older countries of Europe, then we have much to answer for. With this fact before us, the study of European precedent should be carried on with care, more with a desire to analyze principles than with the distinct purpose of reproducing details. In our new country, the conditions no longer exist under which the great cities of Europe were created. New influences prevail, new questions are being asked, new problems are being solved. Will not our America give a new and more virile solution?"

In harmony with this spirit of progress, the better class of the great corporations as well as the local corporations are lending their influence and means to the betterment of public conditions. City officials, as a rule, are ready to co-operate with local organizations for civic embellishment, and many times are the leaders in such movements. As a means for multiplying the good results attendant upon this civic campaign, we would suggest that the Mayor, and also the heads of the various departments as far as practicable, secure the assistance, in an advisory way, of some of the leading citizens—both men and women—to plan for the harmonious development of an entire community. There are men and women in every municipality, no matter what its size, who are especially equipped, by training and experience, to assist in the improvement of the streets, the development and extension of the parks, the establishment of play grounds, and the like, and who would be willing to lend a hand in such work without remuneration. This plan works well in foreign cities and has been tried with more or less success in some American municipalities. There is no reason why it should not be more generally practiced.

A City Plan Committee

Mayor McClellan, at the earnest solicitation of the Municipal Art Society, has appointed a committee to investigate and report plans for beautifying and developing the Greater New York, taking into consideration the diversity of interests involved. The laying out of new streets or the widening or extension of old ones, the choice of pavement

best suited to particular thoroughfares, the construction of electric conduits, the selection of transportation routes, the erection and embellishment of public buildings, and every other step entering into the creation of the city useful as well as beautiful, will be studied and reported upon by this committee. It is a task of immense proportions and much more difficult of solution than that confronting the Washington City Plan Commission, because of the commercial and maritime interests, the topography, the greater population to provide for, not to mention the numerous things which will need correction before anything like a harmonious or complete plan can be carried out. It will cost millions and take several generations to finish any comprehensive plan that may be developed.

Last December the Board of Aldermen passed an ordinance authorizing the Mayor to appoint this committee and fifteen thousand dollars have been appropriated for the expenses incident to the development of the preliminary investigation and plans. The committee held its first meeting in the City Hall last month and organized for work, with Mr. F. K. Pendleton as chairman and Mr. Nelson P. Lewis as secretary. Hon. Daniel S. LeMonte, Hon. Jacob A. Cantor and Mr. Frank Bailey were appointed a special committee on plan and scope.

If the development of every city and town were placed in the hands of a similar committee, provided the committee were of the right sort, civic development in America would be more wisely and rapidly achieved. The fact that there is an abundance of good material in every community for such a committee, places it within the realms of possibility. It is up to the mayors and legislative bodies to take the initiative.

Home Rule for Cities

Business men as mayors have not been uniformly successful, and the reason is not far to seek. Municipal administration is as much a profession as that of civil engineering, the law or medicine, and to take the average business man, no matter how capable and successful he may have been in his chosen line of work and put him at work on a new line, and in unfamiliar surroundings, and then expect him to be a success is at once unfair and absurd.

We have heard much of the success achieved by British municipalities.

Our cities are the merest creatures of the State. They are not self-governed, but are governed by a despotism tempered by partisanship.

How really weak and lacking in power our cities are, few realize. A few years ago Mayor Hart of Boston had to go to the State Legislature for power to place the city's advertisements in the city record, and a predecessor was compelled to go to the State House for authority to connect two city buildings by electric wire.

Why should our cities be so humiliated? Why should they be held in such subjection? Why deprived of the power to do even the ordinary and necessary things? Why not in the fundamental law of the State once and for all declare that each city shall be vested with power to perform and render all public services and with all powers of government, subject to such limitations as may be contained in the constitution and laws of the State.

The habit of looking to the Legislature for relief from local ills is subversive of good government and good citizenship. It creates a false feeling of dependence. It teaches the cities to look outside of and away from themselves for that relief which they should apply themselves.

Good government does not and can never be secured through divided duties and divided responsibilities, no matter how perfectly balanced. It does depend upon specified duties and absolute responsibility joined with adequate power. We must teach our cities and their citizens to walk without crutches; nay, more, we must take away the crutches of legislative interference and supervision or soon the power to use their limbs shall have passed over them.

CLINTON ROGERS WOODRUFF.

Earnest Plea for Underground Wires

MAYOR GASS, of Knoxville, Tenn., is reported to have several hobbies. One of them is to have all overhead wires placed underground in properly constructed conduits. The citizens of that city are to be congratulated on having a mayor who has such a hobby, for there are few improvements that are more needed than that, in cities the size of Knoxville. We hope that he will ride this hobby to some purpose and win out in the race. It would be well for other mayors to ride the same kind of a horse.

Killed by Dynamite

DYNAMITE, the dangerous explosive, continues to get in its work with unremitting regularity. Deaths and serious injuries from the use of this explosive are of frequent occurrence in Greater New York and elsewhere, although the safety explosives are being more and more employed, both by contractors and the city. These accidents are of more frequent occurrence in the winter than in the summer, because it is so often necessary to raise the temperature of the dynamite before it can be successfully used. This thawing process is not always successful, except in furnishing a speedy and sure passage of one or more victims to the Great Unknown. City authorities would conserve the public safety of any community by bringing about the passage of an ordinance prohibiting the use of the dangerous explosives within city limits, and making mandatory the use of the safety explosive.

Value of Fireproof Safes Demonstrated

THE recent large fires in Baltimore, Rochester and elsewhere, and in large public buildings, as in the capitol buildings of Iowa and Wisconsin, have fully demonstrated the value of fireproof vaults. Without exception, where valuable private and public documents were deposited in what are known to-day as properly constructed fireproof vaults, they escaped without injury. For an ordinary fire the ordinary safe will answer; that is, where no intense heat is generated, but otherwise the ordinary safe is valueless. Many examples were found in the Baltimore fire, particularly, which gave conclusive proof of the efficiency of such vaults and the uselessness of the ordinary safe.

These instances afford the strongest kind of argument

why every city should use something besides the common safe for the protection of its valuable records and documents. In the fire which occurred in the Wisconsin capitol building, above referred to, there was no loss of records and documents in those departments which had been properly equipped with fireproof vaults, while in those which were not so equipped the loss of such documents was almost complete—very little was saved from the intense heat. With the present perfection of constructing fireproof vaults and the advent of metallic office furnishings, including letter files, roller top desks and so forth, especially when the price is reasonable, there is no excuse for the valuable records and documents which, of necessity, must be preserved by city governments, being left at the mercy of the flames as in most cities and towns is the case. Here is a splendid opportunity for the wideawake mayor and alderman to show their usefulness not only to their constituents but to future generations, for even at considerable expense it is wiser to provide the means necessary to preserve such records.

Detroit Wants a 3-cent Fare

Mayor Maybury, of Detroit, in conformity with a resolution of the Council, has asked Governor Bliss, of Michigan, to call a special session of the Legislature, to pass a law enabling the people to regulate street car, telephone and gas rates. The citizens of Detroit want a straight three-cent fare for street cars with transfer, cheaper gas and the power to keep the telephone charges down to the present low figure. Mayor Maybury has a way of getting anything which he goes after in real earnest and he claims that a recent decision of the United States Supreme Court gives the power to the Legislature to pass an act which will enable any city to regulate and control the prices for such service as may be rendered by quasi-public corporations. The outcome of his effort to control the corporations in his city will be watched with the keenest interest. There is no doubt that such regulation is needed, and there is little doubt that some of the present evils in this direction would be remedied if the public officials were to perform their full duty without fear or favor to the corporation.

Fire Alarm System Needed in New York

Now that the citizens of Greater New York are thoroughly aroused there is some hope of having the city supplied with an adequate fire alarm system. Former Commissioner Sturgis failed utterly to appreciate the real need of the New York Fire Department. Not a week passed during his administration, nor since, that there was not a fire somewhere in the city at which the loss was greater than it should have been because of some defect in the fire alarm system, or because the water pressure was too weak. Luckily for New York the attitude of Commissioner Hayes is the opposite, and he has already taken steps to bring about a thorough overhauling of this part of New York's fire department equipment, while Mayor McClellan and Commissioner Oakley of the Water Department will co-operate with him in the effort to bring the water service up to the proper standard. While the New York Fire Department, as a well organized and well trained body of men, is the best in the world, the apparatus placed at its disposal has not always been of the best, as, for instance, in the cases cited. The splendid work of the men has prevented, heretofore, the more serious consequences that might be expected from a defective fire alarm telegraph and an insufficient water supply, but to continue this condition with no attempt to supply the needs of the department is to invite a repetition of the Baltimore disaster.

The preparations now under way for the installation of an auxiliary salt water system will relieve the water shortage for the most part, especially in the congested parts of the town, but there will still be the necessity for a more thorough inspection of fire plugs and an increase of their number. The expense involved in these various improvements may be large, but the cost, in lives and property, from neglect or non-installation of these essentials of the fire fighting plant will be far greater.

Meters Only Remedy for Water Waste

Quite recently, Mr. Daniel W. Mead, consulting engineer, made a thorough investigation of the water works system of Moline, Ill., and in his report to the city authorities pertinently said:

"I am, personally, a believer in a provision for the most liberal use of water, but the wanton waste which is taking place in your city I regard in the light of its effect on the purification of the water supply as a crime against life and health of your citizens, which demands on your part immediate, prompt and radical action; otherwise you will be compelled in spite of the large investment you have made, to purify the water supply, to pump unfiltered water into the mains. Water partially filtered is worse than if no attempt to filter is made, for it gives false security, based on which many will be led to use the water for drinking purposes who might not otherwise do so, and partially filtered water is most likely to lead, on this account, to outbreaks of typhoid fever, diarrhœa, or other water born diseases.

"The only remedy for this wanton and inexcusable waste of water is careful and thorough inspection and the use of meters. All connections should be looked up, unknown services and unknown sources of loss should be sought, and a prompt and immediate remedy applied."

With the intelligent use of water meters and the meter seal, which prevents any tampering with the meter, together with careful inspection, wanton waste of water can be efficiently checked anywhere, and at a great saving to the city.

Convention Dates

April

The National Municipal League will hold its annual convention at Chicago, Ill., in April. Clinton Rogers Woodruff, secretary, 121 So. Broad street, Philadelphia.

August

The League of Georgia Municipalities will convene at Savannah, Ga., August 10, 1904. Mayor Bailey, secretary, Griffin, Ga.

October

League of American Municipalities will meet in seventh annual convention at St. Louis, Mo., October 4-6. Hon. John MacVicar, secretary, Des Moines, Ia.

How to Puddle

————, Pa., March 14, 1904.

Editor, MUNICIPAL JOURNAL AND ENGINEER:

I wish you would inform me of the best way to puddle with clay. I have a reservoir to puddle as soon as the weather is fit, and wish to know how to mix the clay and how to place it on the sides and bottom to make a good job.

W. B. JOHNSON.

There are two significations given to the word "puddle." The first is the true meaning and signifies mixing clay and an excess of water so that a semi-liquid, "sloppy" mixture is secured, or a "puddle." The second signification is the mixing of the clay with enough water to render it soft and plastic so that it can be handled. As your letter indicates that you wish to place a thin lining on your reservoir, the second method is suitable to your case. You should proceed about as follows:—

Select a pit or source where a gravelly clay is found already naturally mixed, the proportion of clay and gravel being about equal.

If possible, on excavating break up the clay into small pieces about the size of macadam stones and spread them out to dry. This will save considerable in the haul as the water will have evaporated from the clay. If the haul be short, this may not make much difference.

Deposit your clay in place on the bottom of the reservoir in layers six inches in thickness. Then moisten the clay with water by sprinkling, allowing the water time to sink into the mass so as to render it soft or plastic.

For the *bottom,* ram or roll the clay thoroughly to compact the mass and squeeze out all the surplus water.

For the *side slopes,* mix the clay an a board until it becomes moist or plastic just as you would mortar, and bring it to the slopes in buckets or the like. Dump the mixture in thin layers, starting at the bottom and using a little water between layers so as to cause them to unite. Then ram the layers into place and trim the face of the slope after material is dry.

If you have to construct a wall in a trench, the method then is to form a real puddle. Dump into the trench your dry clay in layers and use an *excess* of water, working the same and the clay together so that it becomes "sloppy," or a "puddle." The mass will be too soft to support a man and a board must be suspended across the trench a few inches above the level of the upper layer for the man to stand on. To "puddle" the mass, cut with a spade through each layer of clay in thin slices, one-half to one inch thick, and then cut similarly in a transverse direction, letting the water into each cut so that thin mud is formed in the cuts and that the small cubes or prisms may be cemented together thereby. Each layer must be thoroughly incorporated with the top of the preceding one.

The success of the puddle depends on the rapidity with which the water leaches out through the surrounding earth. The quicker this takes place, the more rapid will be the settlement of the mass and the more compact it will become. When a course of puddle is not finished at once, the same should be protected from inquiry by cracking or checking on drying.

If your slopes are too steep to hold the clay step the sides to increase the holding power. On large slopes, the clay can be rolled by passing a roller over the same when in proper condition. Sometimes a grooved roller is used to compact the clay, the weight of the roller being about 150 pounds to the linear inch of roller.

If only pure clay can be obtained, it is necessary to mix fine gravel with it; in the case of the trench puddle a thin layer of clay and then one of gravel being placed alternately in the trench and worked together with the excess of water. The proportion of clay in such a mixture should be from 30 to 50 per cent. Pure clay could not be used, of course, because of its well-known property of shrinking and cracking on drying. Round gravel stones should be used in preference to sharp-cornered ones, because the round stones work together better and do not disturb the clay mass.—*Engineering Editor.*

Personalities

—Mr. Thomas Connelly was chosen mayor of Vailsburg, N. J., on March 8.

—Elections in Hornellsville, N. Y., on March 1 resulted in the selection of William S. Charles for mayor; Frank A. Jones for chamberlain, and James A. Parsons for recorder.

—Mayor Cullum, of Duluth, Minn., is reported to have appointed the following city officials: City attorney, Bert Fesler; city engineer, T. F. McGilvray; health commissioner, Dr. D. D. Murray.

—City Electrician John Dunn, of Cleveland, O., has suggested a plan by which the drinking water of the city can be purified by means of the electric current. His idea is to turn a heavy current through the water in a reservoir, when all the germs will be killed.

—The following city officers were re-elected in Lynn, Mass., March 1: City treasurer, Hartwell S. French; city auditor, Austin H. Edwards; city engineer, George I. Leland. Mr. Arthur W. Pinkham was appointed park commissioner in place of James E. Jenkins.

—As an outcome of a number of legal squabbles, Ex-Alderman James Craig, instituted proceedings to have Mayor Brault and the whole Council of Dominion, Mich., dismissed from office because they bonded the town for $10,000 as a bonus to a railroad. Craig claimed that this was illegal.

—The Grand Jury of Chicago voted true bills against Commissioner of Public Buildings George Williams, charging him with misfeasance; Inspector Edward Laughlin, charging him with malfeasance; and three others, because of the fire in the Iroquois Theater. Mayor Harrison was exonerated from all blame in connection with this disaster.

—City Clerk James F. Connolly and John H. McLeod of Newark, N. J., are joint inventors of a device to be used in connection with the voting machines which were tested in the city last year. The invention consists in utilizing the case, in which the machine is packed, for a support by simply turning down the sides and securing them after raising the machine from the floor.

—Mayor Rose, of Milwaukee, Wis., recently vetoed an ordinance prohibiting expectoration. While Mayor Rose believes that expectoration in public buildings and street cars should be stopped, he is opposed to the sidewalk prohibition, because he holds that it is necessary to spit in this

climate. Spitting on walks should not be prohibited until spittoons are provided in all public places.

—Mayor Charles D. Bird, of Wilmington, Del., is a strong advocate of municipal ownership of public utilities. He believes that his city should install an electric light plant of its own, instead of paying a large sum ($40,000) each year to a private concern. He points to the water works and the collection of ashes by the Street Department as evidences of the success of city-owned public utilities. He also believes that the city should run its own street cars, although he thinks that is a little in advance of the possible at this time.

—In his annual report to the Council of Canton, O., City Solicitor Denver C. Hughes recommended in regard to street improvements that, "All street improvements should be assessed upon the benefit system, except in those instances where all of the properties front upon the improvement. The assessing of properties on cross streets by the front foot system, necessarily leads to great loss to the city, by reason of corner lots, which, under the decision of the Supreme Court, are free from a large share of every improvement. During the past five years the cost to the city over its two per cent, portion and cost of intersection has been between $25,000 and $30,000, most of which is traceable to reduction of assessments allowed on corner lots."

A Mayor with Ideas

Mayor Thomas Brady
Bayonne, N. J.

Inspired by the example set by Mayor Thomas Brady, the city officials of Bayonne, N. J., are busier than ever before. The Mayor is a worker and his enthusiasm has extended to even the business men of the city and they feel that each one must do his best to build up and beautify his city. Mayor Brady is a man of fifty odd years of age and enjoys the best of health. He is superintendent of the Consumers Coal & Ice Company and was elected mayor of the city last year, taking office on January 1.

In an interview with Mayor Brady, he gave out some of his ideas on civic questions, including what he will do in improving the streets. He proposes to go over as many streets as possible and have the curbs reset and the sidewalks relaid, compelling the property owners to have the work done or advising them that the street commissioner can do the work cheapest and that he will do the work and charge them for it. He stated that the city was then negotiating for a road roller with which the streets would be kept in good condition. It was also proposed to obtain a large street sweeper. With the trimming of trees and the enforcement of the ordinance against throwing papers in the streets, the city would be more presentable.

Mayor Brady is in favor of having the Chief of the Fire Department an appointee, holding office during good behavior. This would give him a chance to learn his duties and become of service. The term, at present, is for one year only. A salary of $300 at least should accompany the office. Regarding the new police trial board, Mayor Brady said it should be a great improvement and might grow into a police commission, the ideal method of governing such a department.

His faith in the future prosperity of Bayonne is very great and five years should see a large growth in business. He is in favor of encouraging in every possible way the location of large business interests in his city.

Nashville's Water-works Make Money

A substantial increase in revenue from water was received by the Water Department of Nashville, Tenn., the receipts amounting to $171,940.13, or $12,735.19 more than in 1902. The operating expenses were $69,046, including the purchase of 157 new water meters, the exchange of 250 one-half-inch for a similar number of five-eighths-inch meters, and an improved lathe for the pumping station. The actual operating expenses were thus but $57,138.65. The pumpage was largely in excess of that of 1902, having been 4,531,434,667 gallons in 1903 as against 4,158,407,971 in 1902. No allowance for slip or leakage was made. The coal cost considerable more than in 1902. About six miles of new mains were laid and forty-one new hydrants set. A total of 379 meters were set during the year, making the total number in use 4,033. There still remain about 4,500 unmetered taps. The city requires that water takers lay their own connections to the mains and charges double rates for consumers outside of the city.

Finances of St. Paul

The budget for the year 1903 for St. Paul, Minn., was fixed by the Council at $2,848,505, and the disbursements during the year amounted to $2,877,512.93. The estimate of the value of the city property is placed, in the report of Comptroller Louis Betz, at $18,165,000. The total interest-bearing debt of the city on December 31, 1903, amounted to $9,745,642.50, of which $8,072,600 was bonded and the remainder floating, which consisted of park loans and tax levy certificates.

During 1904 there will fall due general bonds and park loans in the sum of $132,542.50, to meet which there was in the general sinking fund $50,542.50. The remainder would be obtained by refunding. The bonded indebtedness of the city was made up of $2,376,000 of water bonds, $1,371,600 for main sewers, $1,315,000 for bridges, and the remainder for streets, building and other necessities of the city.

The general cash statement for the year shows a total of $6,138,527.62 receipts, but several amounts, helping to make up this total, appear to be transfers from different funds, and therefore have no place in the cash statement. The total for cash disbursements is given at $6,138,527.62, but the same difficulty appears here—namely, that considerable amounts appear to be payments into funds, and therefore but transfers and not actual cash disbursements. If an explanatory note were appended to each table, stating in general what was the practice in disposing of, or collecting, the amounts appearing in the table, it would be of material benefit to other officials in interpreting the figures.

FROM THE MAYORS' VIEWPOINT

What Their Cities Need in Improvements to Paving, Fire Supplies, Sewers, Water Supply, Paving Machinery, Etc.

Equal Rates for All Water Consumers

THE question of economy in public expenditure should be carefully considered by the Council of Salt Lake City, Utah, according to Mayor Richard P. Morris. He claimed that for the past few years the expenses have exceeded the income, in 1903 the deficit being $35,579.78. Past administrations have covered deficits by the sale of city real estate. While the water department showed an apparent surplus of nearly $60,000, he claimed that, in reality, the works have not been self-sustaining. He urged a change in the sliding scale of the water meter system because it is unjust to the great mass of metered small consumers. The large consumers pay about one-third of that collected from the small takers. All should pay the same rate irrespective of the amount of water consumed. "I do not believe that the city has the right to barter our water supply to the highest bidder, to the injury of the majority of the people." In many cases with the large consumers, no readings are taken of the meters, but the same assessments are charged month after month. Mayor Morris endorsed the recommendation of Chief Devine for an office of electrical inspector. No franchises should be granted without adequate return to the city; at present but ten lights are given in return for the lighting franchise. The police department should be increased, an intercepting sewer should be built, and a wide-tire ordinance should be passed.

Council Warned to Obey the Laws

MAYOR SWEENEY warned the Council of Wheeling, W. Va., that it was not observing the State law in regard to providing for the expenditure of the ten-cent levy fund. Then, too, business methods should be applied in the appropriation of money through Council committees. Certain portions of the city charter should be revised, the Health Department should be more liberally supplied with funds, the office of building inspector should be created, and political reward should not enter into the question of selecting public officers. The streets should be improved, a better sewer system secured, and a greater and purer water supply obtained. The Gas Department should be relieved of the burden of lighting the streets with electricity, which must be done out of the revenues of the gas plant, although but a certain price can be charged for gas.

Improvements Recommended for Atlantic City

MAYOR FRANKLIN P. STOY, of Atlantic City, N. J., recommended that sentiment in regard to the beautifying of the city in honor of the fiftieth anniversary, be tempered with practicability. Thorough and constant cleaning of the streets would itself be a great attraction to visitors and the planting of trees is to be recommended and a request to the State Forestry Commission should be made for information as to the proper kind of trees to plant on the streets. More care should be taken to see that paving contracts are carried out than has been the case in some recent instances. The city has been free from all contagious diseases and epidemics. Mayor Stoy recommended that the present city garbage plant be repaired so as to be in condition to take up the work if the company having the contract should fail. He recommended that the plans of the Water Department for better service be carried out, commended the Police Department for its good work and the steady improvement in the lighting of the city, and urged that the Board Walk be widened to meet the demands of the summer crowds. Immediate attention should be given to the burying of all wires, the importance of the matter justifying any reasonable expense.

Meters to Remedy Exorbitant Water Rates

THE receipts for the year 1903 were larger and the expenditures smaller than in 1902 in the city of Birmingham, Ala., according to Mayor W. M. Drennen. The increase in number of school children makes necessary another high school this year. The fire losses were nearly one-third those of 1902 and the department has been increased by the addition of ten men and the purchase of a Metropolitan engine, three hose wagons and 3,000 feet of hose. He recommended that special consideration be given the Police Department, because of the revenue it produces from fines and the prisoners that were used for working on the highways. While the water company is complying with the contract to install filters, the exorbitant rates charged cannot be settled until the people are willing to put in meters. If the matter were taken to the courts, the Mayor believes that the meter system would be at once fixed upon as the only fair means of paying for water. He is of the opinion that the railroads should build a union passenger station to cost at least $1,000,000.

Paving an Essential Requirement of a City

"To any intelligent citizen it must be apparent that paved streets are one of the most essential requirements of a modern city, without which, progress in other directions is greatly restricted." Mayor Charles E. McLean made this statement in his annual report and urged that the paving improvements that had been started should be continued until the city of Mobile, Ala., attains the degree of prominence to which she would be entitled. The sidewalks too, should receive proper attention and all citizens were urged to place proper ones before their property. The Mayor recommended that a public bath be installed, that the police telephone call system be renewed, and that the five days' leave of absence with pay for police and firemen be abolished and an increase of $5 per month each year be added until the salaries reached $60 a month. By discontinuing the leave of absence with pay, together with other economies he suggested, Mayor McLean stated that the above increase in salaries could be met.

Raising the Grade of a City

After considerable discussion, the contract for raising the grade of the city of Galveston, Tex., was approved and the bond of the successful contractors, Messrs. Goedhart & Bates, of New York, in the sum of $300,000, was accepted by the city. The firm will now start on this immense work of raising the city's grade seventeen feet, which, with the large sea wall that has been installed, will make it impossible for any storm to again overwhelm Galveston as happened in September, 1900. The raising of the city was necessary on account of the sea wall, which converted the territory behind it into a basin which would hold any water that succeeded in getting over the wall.

The difficulty that confronted the contractors was where to get the material for filling in and how to distribute it cheaply enough to allow a profit. The suggestion to use self-loading hopper dredges to carry sand to distributing stations on the sea front, was not feasible because of the danger from storms. Distributing the material from the bay would hinder traffic. It was finally decided to dig a canal parallel with the sea wall and just inside of the same. This would permit of the material excavated being used for filling, the main portion of the material would be taken from the bay, with consequent benefit to shipping from a deepened harbor, and traffic would not be interrupted. The filling in will be done by hydraulic dredges. It is estimated that 11,000,000 cubic yards of filling must be done to secure the required grade.

The city has suffered from storms, more or less severe, a number of times, but none equaled that of the last. In 1834, 1837, 1847, 1854, 1867, 1875 and 1886 severe storms damaged the section to be filled in, but the citizens refused to abandon the city. The sea wall that is soon to be finished, will protect three sides of the city, running along for 17,593 feet, and will be seventeen feet high. The bottom will be sixteen and the top five feet wide, the outer side curving so as to be vertical as it rises, that the waves will not run over. Sheet piling and rip-rap will protect the base, extending about thirty feet into the sea. The wall itself is of concrete, and will cost $1,198,318.30 when finished. A broad drive will be constructed just back of the wall and afford a magnificent boulevard and breathing space for the citizens. The estimated total cost of protecting Galveston from future attacks of the sea has been placed at $3,505,040.

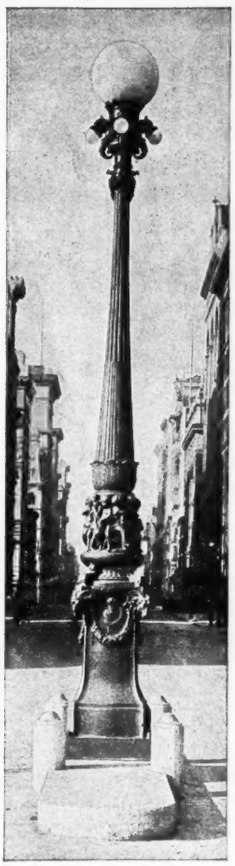
The payment to the contractors is to be made as follows: 10,000,455 cubic yards at the rate of 18.5 cents per cubic yard; 15,000 cubic yards of mainland soil or loam spread in place and sodded for Division "C" at the rate of 30 cents a cubic yard. A section of the contract provides that the city shall not be called upon to pay more than $2,000,000, the amount allowed by law, for work or materials as expedient or necessary in connection with the furtherance of the work. The city is to have the right to curtail and reduce the amount of work to be done at any time so as to keep the expense within the law. The city is to provide the contractors with the right of way for a canal not to exceed twenty feet in depth, nor 100 feet in bottom width and with slopes not more than one foot vertical to two horizontal, and to top of the nearest slope is not to be nearer than 100 feet to the jetty. Street railway tracks and houses in the line of the canal must be moved by the contractor so that they may be used during the period of filling in. As rapidly as the filling-in is completed, the contractor must restore the said tracks and houses to their original position. Regular users of city water must not be deprived of the same because of the existence of the work.

Health Conditions in Syracuse

Much was accomplished by the Health Department of Syracuse, N. Y., during 1903, according to Commissioner of Public Safety Charles Listman. The increase of the work keeps pace with the growth of the city's population, the expenses last year having been $86,048.97. Health Officer Frederick W. Smith stated in his report that, while there was a greater intelligence regarding matters of health and hygiene among citizens than heretofore, there was a corresponding public and individual indifference to sanitary requirements that is often astonishing. Syracuse has a death rate (13.6) below the average for cities of her class and the increase in sewerage and paving has helped not a little toward this result. In his opinion, next to sewerage and good water, good pavements produce ideal sanitary conditions in any city. The ordinance against cess-pools and privy vaults where water and sewerage are available has caused the abolition of many of these air and soil-polluting nuisances. The Health Department will enforce this ordinance vigorously. The surroundings of Skaneateles Lake, the source of the city's water supply, must be greatly improved before all danger of pollution is removed. All the privy vaults on the shores of the lake should be removed and a sewage disposal plant should be installed at a sanitarium that drains into it. The city should obtain as much of the lake shore as possible and appoint a patrolman to inspect the shores.

Next to the purity of the water supply is the purity of the milk supplied to the citizens. There has been a marked improvement in Syracuse's milk supply due to more sanitary stables and the care taken in cooling the milk. Because the cows of any dairyman produce milk containing 5 per cent. of fat, he has no right to remove 2 per cent. of the same because the law provides that milk must contain 3 per cent. A veterinary was employed to examine all the cattle supplying the city with milk and the good results obtained justifies the permanent retention of such an officer. The majority of typhoid cases came from outside of the city, and there were seventeen deaths in all. Diphtheria caused twenty, and scarlet fever two, pneumonia 167, and tuberculosis 152 deaths. Pneumonia is fast becoming the most common cause of death and is due to "over-housing, overcrowding, over-clothing, over-eating and drinking, and overcoddling," all defects of civilized life. Greater attention should be given to the inspection of the schools to prevent the attendance of children suffering from contagious diseases. The Board of Education prevented the Health Department from carrying on such inspection. The question of baths in connection with the schools has received Mr. Smith's hearty endorsement. The erection of a hospital for tuberculosis patients was also strongly recommended.

New York's "Isle of Safety"



"ISLE OF SAFETY" ON FIFTH AVE.

THE first "isle of safety" placed on New York's streets is shown in the accompanying illustration, kindly loaned us by the New York Edison Company. It is situated on Fifth avenue at its intersection with Twenty-third street where the traffic is very heavy. The Municipal Art Society presented the electrolier to New York in the hope that the latter would place others of similar character at points of congestion throughout the city. The design for the electrolier was made the subject of a competition by the Society and the successful designer received a prize of $500 and the commission to execute the necessary drawings for the work. Prizes of $100 and $50 were given for the second and third best designs. Mr. Victor A. Ciani won first prize. The "isle" was formally presented to the city last September, and will prove how essential are such resting places in the midst of a city's crowded streets. English and Continental municipalities have long used these "isles of safety" and the Merchants' Association of San Francisco not long since presented an "isle" to that city.

Abolishing the Bill-Board Nuisance

THE city of Colorado Springs, the popular resort of the Rocky Mountain region, has set a good example to other municipalities in the way of ordinances directed against the bill-board nuisance and other advertising abominations. One ordinance strictly forbids the placing of advertising material of any kind on telegraph-poles, fences, awnings, and elsewhere in the business section of the city, and another prohibits the use of vacant lots for bill-boards, except upon the written consent of all adjoining property owners. In any case, according to another ordinance, all bill-boards must be thirty feet back from the street fronts and fifteen feet from side streets. Again, they may not be over twenty-one feet in length, and must be at least three feet above the surface of the ground. Heavy fines are provided for the violation of these laws. The police have been somewhat lax in the enforcement of these ordinances, and recently the local chamber of commerce and many prominent citizens have taken up the matter in vigorous fashion, and have secured a pledge from the authorities that the law shall be strictly enforced hereafter. What has thus been accomplished in Colorado Springs can be done elsewhere, provided only that there is some one public spirited enough to take the initiative in securing the enactment of proper ordinances, and provided also that there is enough civic pride and intelligence in the community to give such effort adequate support.—*Leslie's Weekly.*

Road Law Proposed for Maryland

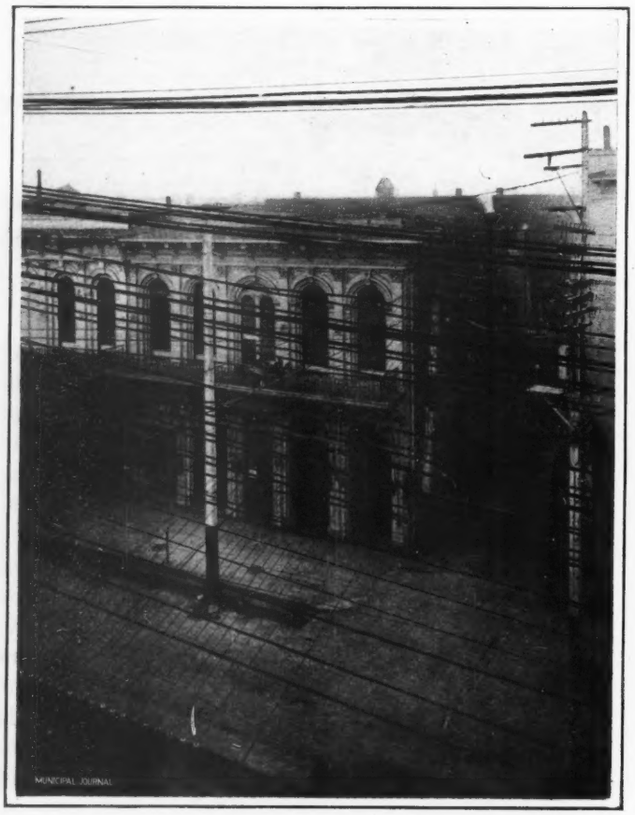
THERE is no more effective argument for the improvement of roads than a sample stretch of the right kind and the Maryland Geological Survey has found, through experience, that often the opponents of good roads are so through ignorance of the results accruing from them. In the opinion of Mr. A. N. Johnson, highway engineer of the Survey, from one-fourth to one-half the cost of any road should be paid by the State, the country to pay the rest. The road, however, should be the most traveled one in the section that the greatest number can become acquainted with its benefits. To do this, however, a large addition of modern road-building machinery must be secured by the State. At least eight road-rollers and as many sprinkling carts should be obtained, and a number should be loaned to such counties as cannot afford to own such a machine. The expenses of operation and a small rental should, of course, be paid by the county.

For the past six years the Survey has been studying constantly the road systems in the different counties and suggested a law based on the following principal features: A Department of Roads to consist of three persons, one to be elected every year for a three-year term. This board should control all road monies, and should appoint a road engineer, who should have charge of construction and repair of roads Counties should be divided into road districts and the roads in each should be named by familiar names, each being classified according to travel into first-class, second-class, etc. Each district should have a supervisor to give his entire time to the work and the larger districts should have a corps of men retained year after year that they may be experienced in road-building. Each year the Department of Roads should allot two-thirds the total amount of road levy for any district to the exclusive use of repairing roads and bridges; the remainder to form a fund for the building of large bridges and special improvement of important roads. The road engineer should submit itemized accounts showing the amounts spent for labor and material on each road. These accounts should originate with the supervisors, be certified by the engineer and all contract work should be certified to by him.

It is urged that a laboratory be established for the purpose of testing paving and building materials for the free use of all public officials and for private persons on payment of a fee. During the past year a number of tests were made to determine the difference between rattler tests of paving brick with steel and with cast-iron shot. Fifteen tests were made with soft and a like number with hard brick. Five tests were made with old cast-iron shot, five with new, and the rest with steel. The percentage of soft brick lost in the rattler with old shot was 24.2, with new cast-iron, 24.5, and with steel, 28.3. The hard brick lost 16.2, 17.9, and 20.7. Ten soft and nine hard bricks were used in each test. The important conclusions to be drawn are that the shape of the shot has little influence, and that the difference between cast-iron and chilled steel shot is about 4 per cent., irrespective of the hardness of the brick.

The Overhead Wire Nuisance

THE Grand Jury of 1902 demanded that all the power wires in Sacramento, Cal., be placed underground, where they would no longer be a menace to life and property. This demand was repeated by the Grand Jury of 1903 and Mayor Bassett, in his inaugural address, treated at length the dangers arising from the presence of these wires as they are. He presented a letter from the secretary of the Board of Fire Underwriters of the Pacific, which urged that action along these lines be taken. The accompanying illustration shows the mass of wires as they appear from the window of *The Bee,* to whom we are indebted for the picture. The conditions are not exaggerated by the picture, as, at some points of the city of Sacramento, the wires are even more numerous.



MASS OF OVERHEAD WIRES, SEEN FROM WINDOW OF *The Bee,* SACRAMENTO

Sacramento is not by any means the only city so afflicted with overhead wires. City after city is suffering from this evil, and few, thus far, have succeeded in getting the wires in conduits. The insulation on the high power wires wears off rapidly and exposes the firemen to great danger when they are called upon to fight a blaze in a building from or over which run these wires. They are a positive hindrance to fire-fighting because it is difficult to operate an aerial truck through them and, as in the case of the recent Baltimore conflagration, the fire streams are often badly broken against them. The Wire Department of Boston is doing good work in putting the wires in that city beneath ground and a number of other cities are doing more or less similar work in ridding their streets of the menace of overhead wires.

City-Owned Street Cars

THE tramway system in Hull, Eng., is superior in many respects to that existing in almost any American city. It is owned and operated by the city. The cars are double-deckers and the fare is 1d. (2 cents) on all lines and for all distances. The financial results of this low-fare system are equally interesting. During the latest twelve months reported on there were ten miles of double track, or twenty miles of single track, in operation. The gross income is about $445,000; the cost of operation was about $233,000. This left a gross profit of $212,000 and, deducting interest on the investment and the sinking sum, a net profit of $122,000, or an average of over $12,000 a mile of double track, which went into the city treasury.

The wages paid look low to an American. Motormen receive from $6.75 to $8.50 a week and conductors from $5 to $6.50 a week. But it must be remembered that the house rents and some kinds of provisions are lower in England than in most American cities. This difference might make it necessary to add $2 a week to the wages of Hull motormen and conductors when comparing them with the wages of the same class of American workingmen. But as the total wages paid on the whole system was a little less than the net profits, after deducting interest and sinking fund, it is evident that wages could be doubled and still a small profit be shown. All the employees are of an excellent class—fully equal in intelligence and efficiency to those employed on any street-car line. A day's work consists of ten hours, the cars being run from 5 a. m. to 11.30 p. m. The speed varies in different parts of the city, the maximum being twelve miles an hour. The overhead trolley is used.

The popularity of the system can be judged from the fact that during 1903, with ten miles of double track in operation, there were 22,062,703 passengers carried. As Hull has a population of 250,000, this means an average of eighty-eight rides for every man, woman, and child in Hull. The length of track is being constantly added to and all the leading streets will soon have car lines.

The electric street car service of Nottingham is an illustration of what is possible, though not always accomplished, in "municipal ownership." Electric trams have now been in use about two years. Previously, horse cars and omnibuses served that part of the public which did not prefer to walk. The present electric system is well nigh perfect. The cars are large double-deckers, kept scrupulously clean and run at intervals of three to six minutes at the rate of eight to ten miles an hour. Practically the entire city is now covered. The length of the route is now fifteen and one half miles, with thirty miles of track. During the year just past the cars carried nearly 25,000,000 passengers—a traffic equal to the transportation of the whole population (250,000) twice a week throughout the year.

The receipts for the year were $560,733, of which the operating expenses were slightly over 50 per cent. The gross profit was 11.41 per cent. of the capital employed. After deducting loan charges, the net profit amounted to $150,-141, from which the rates received $87,597 and the reserve fund the balance. During the two years the electrical railway has contributed $145,995 to the city rates and has established a reserve fund of $98,089.17.

The power for the operation of the street car system is provided by the city's electric supply plant. The charge is 2½ cents per unit.

Taking due account of depreciation and unexpected charges, it is believed that the tramway undertaking will yield a substantial yearly profit, to go toward reduction of municipal taxes, besides giving the public a highly satisfactory service at low fares.

New Sidewalk Ordinance in Bay City

It was found necessary to frame a new ordinance governing the construction of sidewalks in Bay City, Mich., because the old ordinance, made but a short time since, did not meet the requirements of a good walk. The new ordinance provides that an excavation shall be made twelve inches below grade and the sub-grade shall be of good material and be well pounded. Seven inches of coarse gravel or screened cinders shall then be filled in, be wet and well tamped while wet. In constructing cement walks the five inches remaining of the excavation shall be filled with concrete made as follows: Crushed stone, five parts; clean, coarse sand, three parts; Portland cement, one part. These materials are to be mixed while dry until an even color has been secured; water is then to be applied slowly by sprinkling, while the materials are stirred constantly. The mixture is then to be placed in position and rammed until water comes to the surface. Before the concrete sets, one inch of stiff mortar made of equal parts of Portland cement and clean, coarse sand, mixed dry and then wet is to be filled in on top. This should be leveled with a straight edge and the surface troweled, the edges next to the roadway being beveled. This walk must be wet three times a day for ten days and it must be protected from the sun and air currents. The top surface should be corrugated, or uniformly indented.

Brick walks are to be laid by placing on the said sub-grade four inches of concrete composed of one part of fine and freshly burned hydraulic cement, two parts of clean, coarse, sharp sand, and three parts of broken stone. The cement must be equal to the best brand of Milwaukee cement and the stone be good limestone broken not larger than one inch. A mixture of uniform color must be obtained and only sufficient water must be used to make a stiff mortar, which must then be rapidly mixed, placed in position, and rammed before the cement can set. The concrete must stand ten days. A cushion of one inch of clean, sharp sand must be laid on the concrete and a course of pattern sidewalk brick with finished top be laid at right angles to the curb. The brick must not vary more than one-eighth inch in width and must be rolled or rammed. The surface must then be swept and a cement grout poured into the spaces between bricks. This grout must be made as follows: One part of English, German or American Portland cement, and two parts of clean, sharp sand, mixed thoroughly dry and then well wet. The surface of the brick must be wet before applying the grout.

Stone walks must be made of flags at least six inches thick and not over eight feet square, the edges cut square, the stones laid on a foundation similar to that of brick walks, and the joints filled with cement grout. All walks must have a pitch of at least one-quarter inch per foot toward the street. The Board of Public Works is to have exclusive charge and management of all walk construction, and if the cost be over $200, bids must be asked. The city is to pay 30 per cent. of the cost of construction; the property benefited the rest.

Advertising a City

SINCE July 29, 1902, a Bureau of Publicity has been advertising the city of Niagara Falls, N. Y., and endeavoring to bring as many conventions there as possible. The gentlemen in charge of this Bureau succeeded in securing thirty-two conventions for 1903 and hope to beat that record in 1904. During 1903 about $4,000 was expended on the work, the necessary amounts being subscribed by the various interests of the city. During the spring and summer of 1903 a press bureau was in operation, which kept a large number of newspapers throughout the country supplied with items of news about the city. An attractive little booklet descriptive of the city, was sent out where it would prove a drawing card. The Common Council of Niagara Falls has commended the work of the Bureau and given it authority to advertise the city officially. The Bureau is doing the same work undertaken by the Chamber of Commerce of Albany and those in other cities.

Courtesy, Albany Chamber of Commerce. *Photo by A. W. Floyd.*

VIEW FROM CAPITOL STEPS, ALBANY, N. Y.

NEWS AND PRACTICE AMONG THE CITIES

Millions for London's Water Supply—"Graft" Committee of Chicago Reports—Health Conditions in Lowell—The Finances of Several Cities

London to Pay Millions for Water Supply

THE arbitration for the purchase of the properties of the private companies that have supplied London with water has been completed and the amounts to be paid for different companies, except in the case of one concern, determined upon. To the eight companies the total award is $161,980,585. The question of the sinking fund of the companies has yet to be settled by the Court of Appeals, the amount involved being $42,891,835. If this amount is sustained by the Court, the total cost to the city will be $204,872,420, to which must be added the interest at 4 per cent. on some of the bonds which are perpetual. The original amount claimed by the companies, including the bonds, amounted to $238,750,000. The amounts are only a little in advance of the expectations of the water officials and the awards a little less than the estimated value of the companies' property as given a couple of years ago.

Ohio's New Code Helped Youngstown's Finances

THE new code of Ohio has proven a benefit to Youngstown, at least, in straightening out its finances better than has been done in years. There are no overdrafts against the city as no transfers can be made from one fund to any other. The total recipts for the year were $751,636 and the disbursements $631,633.33; the cash balance at the end of 1903 was $207,233.22. The bonded indebtedness of the city was then $880,304.

Improvement of Harrisburg's Parks

THE first annual report of the Harrisburg Park Commission was recently submitted to the Council of that Pennsylvania city, showing the work of the year and how the old park laws were repealed by the assembly, and the bringing of the city's parks under the direction of the new board. The general plans and suggestions for parks and parkways have been prepared by Messrs. Manning Bros., of Boston, and these plans are under course of change and modification, so that the city will receive the best return for the amount appropriated out of the general improvement loan. The future as well as the present needs of the park system is being carefully considered so that desirable additions may be made from time to time as funds are provided. The first work was done in improving the water front, the providing of one or two general playgrounds was considered advisable. Only the providing of apparatus remains to be done for these grounds. Improvements were made on one street by cutting away the gutters from the walks on all granolithic pavements, removing the ashes and gravel to a sufficient depth, and replacing the space with good earth in which grass and shrubbery will be planted. The commission has arranged for the purchase of some forty-five acres of ground and hopes to secure an addition of fourteen acres later on.

Report of Chicago's "Graft" Committee

THE long expected report of the "graft" committee of the Chicago Council appointed by Mayor Harrison has been compiled and the Chicago conditions have obtained such notoriety that an outline of the report will be of interest.

Chief of Police O'Neill was considered lacking in executive ability and deficient in securing the proper discipline among his subordinates. In the manufacturing districts the sale of liquor all night was favored. The commission was not altogether in sympathy with the efforts to prevent women frequenting saloons. It had not found any organized system of "graft" in the police department, or enforced tribute from commanding officers. It was recommended that patrolmen be held responsible for the existence of gambling in any form on his beat. The police board was scored for showing leniency toward policemen who were accused of drunkenness and brutality toward citizens. The book of police regulations should be revised and supplied to the members of the force who should be required to study the same. Commanding police officers were scored for failing to suppress gambling, etc., and certain reforms in the city hall were pointed out, especially in the building, fire, water, street, and street cleaning departments and suggestions made to prevent a return to old conditions. A new city charter was recommended and a permanent "graft" committee to be appointed by the mayor, so that complaints could be investigated at once and investigations carried on without interference with other committee work.

Work of Lowell's Health Department

A LIST or regulations for the control of barber shops in Lowell, Mass., was published in the annual report of the Health Board of that city, but the provisions of the same were similar to those in force in many other cities and which have been published in THE MUNICIPAL JOURNAL from time to time. The Board spoke very strongly concerning the nuisance from leaking gas, claiming that the gas company made little or no effort to abate the trouble. The Department collects from the business houses twice a week refuse paper, and carts the same to a dump where salable portions are disposed of and the rest burned. The alleys in the city are in a filthy condition, due to the lack of paving. Filth is dumped into these alleys and, while the Department cleans them every week or oftener, their condition is very bad. All should be paved properly, with a smooth, durable material. This work is more important than the paving of the streets in the same sections. The city has again returned to a normal rate of reported cases of diphtheria, it having taken two years to recover from the epidemic of 1901-2, caused partly by the infection of the milk supply. The Board urged the greater use of antitoxin in the first stages of this disease. Eleven cases of smallpox existed in the city, but spread of infection was prevented by prompt

isolation in the hospital or at home. Only one death occurred from diphtheria, none from smallpox, eight from scarlet fever out of 145 cases, and twenty-six out of 238 cases of typhoid. Up to July, 1903, there had been but thirty-three cases of typhoid, but the drawing off of the reservoir water for a large fire and the pumping of water from the wheel-pit of a manufacturing concern, caused a large quantity of filth to get into the reservoir and mains so that, within forty-eight hours, a large number of stomach and bowel troubles took place and the cases of typhoid fever reported during August amounted to 136. Pneumonia and bronchitis led in number of deaths; the death rate was 18.61, the lowest in the city since 1890.

Chicago's 1904 Budget

EXPENDITURES for 1904, which aggregate $32,322,243, have been planned by the Finance Committee of the Council of Chicago. The annual appropriation bill was completed without cutting the salaries of the employees, as it was feared. A deficit of only $500,000 is shown in this budget and this will probably be met by other funds during the year. The committee allowed the Fire Department 121 extra men, or one for each company, but no provision was made for the twelve-hour ordinance. There was made no provision for the eighty-three vacancies in the police force, but the appropriation for that department is $100,000 more this year than in 1903. An aggregate of $1,494,200 in bonds were provided to pay for improvements to public baths, for new police stations, new fire stations, municipal lighting, and the engineering bureau. Another important item is an appropriation of $200,000 for the installation of water meters, which will form the first step towards the curtailment of waste.

Reservoir Needed in Asbury Park

For the third time Superintendent of Water and Sewers John L. Coffin, of Asbury Park, N. J., asked in his annual report for a reservoir of at least 20,000,000 gallons capacity. During the summer nights the pumps are idle, but must be worked during the day at a pace that subjects them to a great strain. If a reservoir were provided for storing the water a slower rate of pumping could be adopted during the day, but this could be continued all night by pumping into the reservoir. After the coming season, he stated, filtered artesian water could not be furnished for street sprinkling during July and August.

During the year the average daily pumpage amounted to 533,728 gallons. The total pumpage was about 16 per cent. in excess of that of 1902, but all this could not be credited to domestic usage, he stated, for some was supplied to the East Jersey Water Company and street sprinkling consumed a large quantity. The increase in domestic consumption he placed at from 6 to 8 per cent. Allowing for slippage of the pumps, which varies from 1 to 20 per cent., according to the packing, for water used to wash filters, for street sprinkling, for horse troughs and fountains, for testing fire engines and for fire service, there remains a large quantity not accounted for by the total registry of meters. The old distribution system, he said, seems to account for this waste, the pipes, without doubt, leaking, over 250,000 gallons a day. He recommended that the old mains be cut off and all properties connected with the mains of the city system, and that this work be included in the enlargement of the plant under contemplation. He asked, also that a large meter be installed at the pumping plant to record the actual pumpage, as the only means of ascertaining this now is by stroke register of the pumps. There is but a little over $2,500 yet to be paid on the meter account, which will be closed this year. The net earnings for the year amounted to $16,962.55. The earnings from water rates, etc., aggregated $15,997.66, but $11,000 was appropriated for meters, maintenance and construction. The expenditures totaled $25,253.49. The whole system is in good condition, the only other recommendation being the substitution of a 250 horse-power boiler in place of two that have been out of service for some time.

Increase in Lynn's Water Consumption

THE water supply of Lynn, Mass., was much larger in 1903 than during the previous year. An average daily increase of 462,993 gallons took place and if the rainfall had been as low as in 1902 it would have been necessary to pump water from the Saugus River. The average daily consumption was 5,137,527 gallons. When the additional storage basins are completed, a daily supply of 3,335,000 gallons will be available. The Board of Public Works urged immediate action to protect the pipes from electrolysis, which has necessitated the laying of water pipes in a number of streets. The water debt amounted to $2,167,300, the income from water rates was $222,075.26, and the sinking fund had a credit of $655,306.72. Fines from persons who neglected to clean their walks of ice and snow amounted to a considerable amount, but along with the fines came many objections to the ordinance, some claiming ignorance of its existence, others stating that their walks had been cleaned. Others again claimed that crosswalks and other city property should be cleaned and made safe for travel before attention was given to private property.

Financial Condition of Philadelphia

THE financial condition of Philadelphia was shown in the recent report of the Comptroller, John M. Walton. A surplus of $18,411.31 was at hand, although the estimated results on August 1 last showed a deficit of $142,343.52. The total expenditures for 1903 were $36,039,614.73; the receipts from all sources amounted to $28,366,389.72, including a portion of the Subway loan, the excess of expenditures having been $7,673,225.01. The total cash balance at the beginning of 1903 amounted to $17,166,865.49, while the balance this year was but $9,475,841.70. The tax rate of $1.85 on the assessed valuation of real estate yielded over $16,343,000 of which all but about 4 per cent. was collected. On January 1, 1903, the funded debt was, with the outstanding warrants, $6,650,220.53. From this must be deducted sinking fund loans and other assets totaling $29,132,473.78, leaving the excess of total debt over total assets at $31,517,746.78. On January 1, 1904, the gross funded debt and outstanding warrants amounted to $57,725,152.08, which, after deducting sinking fund and other assets, left an excess of debt over total assets of $38,338,054.10, or $6,820,307.32 increase of debt over 1902.

THE FIRE BRIGADE OF WINNIPEG

History of the Department—Troubles of the Early Fire Fighters—Present Department Small—Marvelous Growth of the City

Chief J. E. Buchanan
Winnipeg, Man.

Thirty years ago last November the city of Winnipeg, Man., was incorporated and steps were at once taken to establish a water system and a fire brigade. In July and October, 1874, by-laws were passed to raise a loan of $40,000 to secure the water supply and to purchase fire engines, etc. January 25, 1875, an ordinance was passed providing for the organization and management of the fire brigade, but, meanwhile, a public meeting had been held on September 24, 1874, at which was formed a volunteer brigade of sixty-two men, who had elected Mr. G. U. White for chief and recommended his endorsement by the Council. Six fire tanks were installed in the city and the following apparatus ordered from the Silsby Manufacturing Company: A steam fire engine, four hand hose reels, a village hook and ladder truck, and 2,000 feet of two and one-half-inch hose. After some delay, the apparatus was received and the test of the engine was to fill the fire tanks from the river. The first truck shipped was lost in a railway wreck, the second one was burned on the way, and not till the third attempt did the company get this apparatus into the city.

The First Fire Station

The first fire station site was secured September 4, 1874, and a wooden building erected. On Christmas morning, 1875, this was entirely destroyed by fire, together with the engine, truck, hose, etc. The reels had been left outside because of lack of room and were saved. The same day a mass meeting of citizens decided to telegraph for another and larger engine which was later named the "Assiniboine." The burned engine was repaired and called the "Phœnix." After being repaired, the truck was purchased by Portage le Prairie.

Captain Scott was elected chief in 1875, and the brigade procured temporary quarters in a shed until the new fire hall was erected by the city on Market square. The funds of the department were made up of an annual appropriation of $200 from the Council, donations of grateful citizens, and fines from members. Each member received $1 for every fire and 50 cents for alarms, but was fined $1 for non-attendance at fires and 25 cents at practice, which occurred once a week in summer. Because of dissatisfaction with the remuneration, the brigade was reorganized in August, 1877, and the chief appointed by the Council, Captain McMillan, now Lieutenant-governor of Manitoba, receiving the appointment. Thirty-five men were enrolled in the new brigade. The new fire station was opened on January 3, 1878, with appropriate ceremonies. For nearly a year no fires occurred. Rapidity in responding to alarms was not marvelous in those days, some twenty minutes elapsing between receipt of alarms and getting a stream on the flames. The lack of a good alarm system greatly hampered the firemen in locating the fires. Then after the fires were out, much time was spent in refilling the tanks in readiness for the next alarm. In August, 1880, Chief McMillan resigned because of press of business, and Captain Alex. Brown was appointed Chief. A man was also appointed to strike the alarms on the bell at the fire station, according to the ward in which the fire occurred.

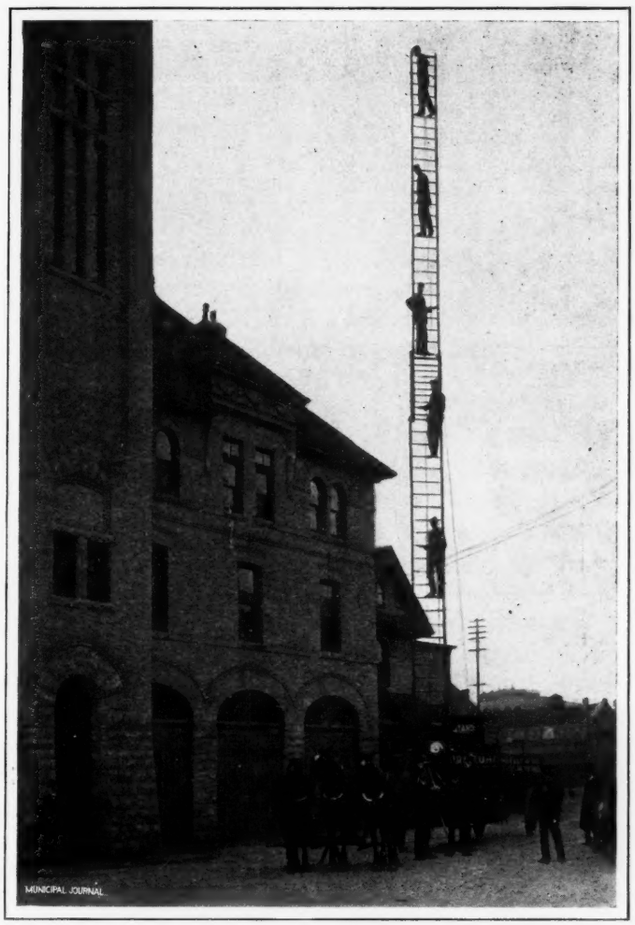
In April, 1882, two new engines were purchased and named the "Alex. Brown" and the "Alex. Logan," the former being a Silsby and the latter a Ronald, made in Montreal. A contest was held between these two engines

NORTH FIRE HALL, WINNIPEG

when, in five tests, the Ronald engine did slightly better than the other.

Volunteer Brigade Disbanded

On May 17, 1882, it was decided to disband the volunteer brigade, thirty-four of the best men having been selected out of 150 applicants. Captain W. O. McRobie, who had served twenty-five years in the Montreal Fire Department, was made chief at a salary of $1,800 a year. There was one assistant chief, three engineers, four foremen and the rest stokers and firemen. On August 24, of that year, the apparatus consisted of three Silsbys and a Ronald steam fire engine, two double chemicals of 160 gallon capacity, a single 100-gallon chemical engine, three horse hose reels, four



WINNIPEG'S AERIAL TRUCK IN FRONT OF CENTRAL FIRE HALL

spare reels, a ladder truck and 8,700 feet of hose. The horses numbered seventeen.

On January 26, 1883, the Central Fire Hall was taken possession of by Chief McRobie with the assistant chief and sixteen men. The apparatus consisted of the Ronald steamer ("Alex. Logan"), a horse hose cart, a single chemical engine and a hook and ladder truck. On the 15th of April the North Fire Hall was opened for the assistant chief, a foreman and eight men, and the apparatus installed was the Silsby engine ("Assiniboine"), a double chemical, a horse hose reel and five horses. The South Fire Hall was not ready until June 19th, when it was occupied by a foreman and eight men, with the Silsby ("Alex. Brown"), a double chemical, a horse hose reel and five horses. The three fire stations were erected at a cost of $60,200.

A new Hayes sixty-foot aerial truck was purchased in February, 1895; after a severe test a month later a Merryweather steam fire engine was added to the brigade's equipment. This was placed in the Central Hall and named the "T. W. Taylor," the "Alex. Brown" being transferred to the South Hall to supplant the "Alex. Brown," which was held in reserve in the same hall. In February, 1899, a Waterous engine was purchased and named the "A. J. Andrews." This was located in the Central station and the Merryweather placed in reserve in this station. The old Silsby was taken in part payment for the Waterous, was repaired and sold to Vancouver, B. C.

During 1886, the old Central Fire Hall was condemned and taken by the Water Department for a store house, and the present one erected at a cost of $30,000 and occupied on February 7, 1899. During the summer of 1900, the brigade members constructed a drill tower at No. 3 station and drills are held here regularly twice a week during warm weather. Two new hose wagons were obtained in 1900 and the old reels placed in reserve.

The Fire Brigade To-Day

The strength and equipment of the department at the present time is as follows: Forty-seven men, three fire stations, four steam fire engines, consisting of a Waterous (1,000 gallons per minute), two Ronalds (800 gallons per minute) and the Merryweather held in reserve, three hose wagons, three hose reels held in reserve, three chemical engines, one sixty-five-foot Hayes aerial truck, one Seagrave hook and ladder truck, twenty-six horses, 12,256 feet of two and one-half inch hose, 1,525 feet of chemical hose, 530 street hydrants, of the Corey pattern, fifty-five fire tanks, twenty-one of which are connected direct with water mains, and 100 street fire alarm boxes, ten of which are private property.

Statistics included in the report of Chief Buchanan showed that the brigade had responded to 518 calls during 1903; had raised 2,082 feet of ladder; used 7,950 feet of chemical hose and 69,550 feet of two and one-half-inch hose; the value of buildings and contents where fires occurred was $2,622,058.21, upon which $1,671,300 insurance was carried, and upon which a loss of $170,160.19 was suffered. During the year the brigade worked 185 hours and 30 minutes. The firemen visited a large number of places to inspect the interiors that they might be familiar with them in the event of a fire.

The Winnipeg Firemen's Benevolent Association was

LOWER PART OF CENTRAL FIRE HALL, WINNIPEG

formed in June, 1882, was reorganized in June, 1889, and struggled along until 1896, when it suddenly took on a good growth and is now in good financial condition. The members have been working hard for the past five years to acquire a superannuation and pension fund and the goal has been about reached. Each member is insured for $1,000 in event of accidental death, and $10 a week for total disability. The funds are partly used for paying the annual premium to the insurance company carrying the risk, the balance being carried forward with the pension fund in view.

Since the organization of the volunteer brigade in 1874, the chiefs have been as follows: G. U. White, Captain Scott, Captain D. H. McMillan, Alex. Brown, W. O. McRobie, William Code, E. H. Rogers, and J. E. Buchanan, the present head. Chief Buchanan entered the brigade on November 7, 1883. He was appointed captain of Station No. 2 on April 1, 1887, and appointed on October 17, 1899, to his present position. He has been president of the Benevolent Association since July, 1898.

Since 1890 the number of alarms has greatly increased. In that year the number was 164; in 1902, 341; and in 1903, 518. During this period the smallest number of fires was in 1896 with seventy; in 1890 they numbered seventy-eight and in 1902, ninety-nine. The largest number previous to that was in 1900, when 194 took place. In 1899 the loss was largest of any of the years mentioned, having been $596,853.62, and the smallest amount was in 1902, with $27,871.49.

To-day, Winnipeg has a population of 77,000, while in 1870 it was but 214, and in 1874, 1,869. The city has an assessed value for the purpose of taxation of $43,963,690. The city is 12,750 acres in area, has over 180 miles of streets, eighty miles of water mains, 183 fire alarm boxes and 450 hydrants.

Fire Department in Brockton

ANOTHER year passed in Brockton, Mass., with small fire loss and Chief Harry L. Marston congratulated the city on its good fortune. Some of his recommendations made last year regarding stations were carried out, but he again asked that another station be constructed on the West Side. The office of assistant chief should be made permanent. The number of wooden roofs should be cut down and something should be done towards the establishment of a protective department, which would be of great value to the city. More apparatus should be equipped with rubber tires, as they can be handled much quicker and with more safety by the men. A pension ordinance should be passed, and a high service water system should be adopted when the new supply is introduced. The Department has thirty-five horses in service. The hose on hand amounted to 100 feet of three and one-half-inch cotton, 12,785 feet of two and one-half-inch cotton; during the year 2,000 feet of hose was obtained. At least 2,000 feet should be purchased this year. The force numbers thirty-seven men besides the Chief, and the apparatus consists of two Amoskeag engines, a Silsby, a Clapp & Jones, a Babcock aerial truck and portable water tower, a Gleason & Bailey and a Rumsey truck, three double tank chemical engines, four hose wagons, etc.

Chief McDowell on "First Offenders"

THE large increase in the number of arrests in Youngstown, O., during the past year was not due, according to Chief of Police McDowell, to an epidemic of crime, but to the closer attention to the details of the work of the department and stricter enforcement of the laws. He said in his report, "It is only by the closest attention to the little matters of police duty that we are enabled to keep under control the larger affairs. Constant watchfulness is the price of success in the police business and it is better for the city to check the criminally inclined at the commencement of their career while their crimes are small than to tolerate or ignore them until they grow to the commission of greater crimes." * * * The number of arrests in a city is not a fair test of the morals of the city, but rather of the efficiency and thoroughness of its police methods." Only four murders were committed in Youngstown and, as these were "crimes of passion," could not have been forestalled. There was an increase of 563 in the number of arrests over 1902, which indicates better police service. While an improvement was made in the personal appearance of the officers, there is still room for improvement.

Regarding the subject of "first offenders," Chief McDowell said, "Each year brings its crop of first offenders and they, as a class, require more attention and study from police officers than the general public understands. The rising generation of criminals is always presenting new and perplexing problems that must be solved for the information of the present and the protection of the future. It is, comparatively speaking, easy to locate and understand the old offenders, for their personal peculiarities and methods are generally known and understood. The new beginner has no fixed methods to follow and, being not fully aware of his danger, is often more daring though his operations are not so large. Each new offender that comes in is a new specimen to be studied and watched until understood. The offense committed is generally a minor one and passes without particular attention from the public. However, the intelligent police officer, who puts brains into his profession, finds in each of them an object of study and the information obtained, while rarely of immediate value, is of the greatest importance in the future when the culprit ceases to be a first offender and becomes an old offender. His history, methods and peculiarities will be known and his conviction easier. The importance of the young offender is shown in the number of them and their proportion to the others. During 1903 there were sixteen persons arrested who were not yet ten years old; eighty-eight who were between ten and fifteen years and 321 who were between fifteen and twenty years of age. This makes 425 persons arrested who had not yet arrived at the age of majority and it is about six per cent. of the total arrests.

It is a well recognized fact that 80 per cent. of all criminals of the professional class use some form of narcotic drug. It is also a fact that a large percentage of all users of narcotic drugs are criminally inclined. The use of narcotics is generally due to a species of progression. They do not become 'fiends' at once. It is not a habit suddenly acquired. It is generally the result of the smoking of cigarettes in early life when the habits and inclinations are being formed. There

is no other practice so bad for the youth of our country as the smoking of cigarettes, as no other practice leads so directly and so certainly to so many other bad things. Cigarette smoking has caused the downfall of more youths than any other one thing. Cigarettes and the drugs to which they lead are not only more certain in their effects, but they have worse effects than whisky and they come quicker. During the last year we have had many victims of this habit under our care."

Gambling came in for the attention of the Chief, who claimed that his city has been remarkably free from this evil and that the department will endeavor to further suppress it. He made another strong plea for a new central police station in which there will be facilities for separating the prisoners according to the degree of crime and their personal conditions as regards cleanliness; at present, all are put in two general rooms, one being below ground.

There were 7,252 arrests during the year, of which 378 were females, and 5,916 were residents. About 50 per cent. of property stolen and lost was recovered.

FIRE AND DUTY RECORD OF LARGE CITIES FOR 1903

	No. Bell Alarms.	No. Still and other Alarms.	Total.	No. Second Alarms.	Third Alarms.	Fourth and Subsequent Alarms.	No. of Fires.	No. of Fires Confined to Buildings where Originated.	Loss on Buildings.	Loss on Contents.	Total Loss.	Insurance Paid.	No. of Lives Lost.	Hours Department in Service.	Feet of Hose Used.	Feet of Ladders Used.	Gallons of Chemicals Used.
Allegheny, Pa.	226	138	364	4	1	..	....	353	.....	.....	.....	$236,417.00	5	...	.....	.....	.....
Auburn, N. Y.	28	66	94	..	..	..	80	79	$35,092.00	$19,087.53	$54,179.53	.....	..	72	24,950	1,270	1,828
Altoona, Pa.	35	234	269	..	..	..	257	256	.....	.....	15,865.45	13,744.95	..	...	19,850	834	669
Akron, O.	135	65	200	2	..	..	189	185	66,945.25	176,933.04	243,878.29	193,951.84	..	548	78,150	954	1,234
Birmingham, Ala.	43	321	364	..	..	..	327	334	44,631.33	75,942.34	139,573.67	.....	1	...	.....	.....	.....
Brockton, Mass.	102	223	328	3	..	..	261	181	19,657.40	37,807.50	57,454.90	52,171.84	4	203	47,880	2,726	7,926
Cambridge, Mass.	219	79	298	3	2	..	297	289	47,451.48	63,952.64	111,414.12	111,404.12	1	...	.....	.....	.....
Chelsea, Mass.	67	67	134	3	..	..	130	128	29,888.98	28,874.50	58,763.40	53,563.80	2	...	.....	.....	.....
Chattanooga, Tenn.	73	93	166	3	..	..	....	161	.....	.....	47,277.22	.....	2	...	.....	.....	.....
Charleston, S. C.	94	95	189	1	..	..	169	163	13,065.75	15,784.60	28,850.35	17,476.35	2	834	62,650	3,983	4,325
Canton, O.	116	...	...	..	..	2	94	88	34,316.30	39,855.52	74,171.82	74,171.82	..	....	.....	.....	.....
Detroit, Mich.	...	...	1,164	4	3	..	1,068	1,068	.....	.....	438,043.00	.....	4	1,144	329,800	21,940	.....
Dayton, O.	290	187	477	10	2	..	453	453	37,534.41	42,130.61	79,665.02	68,549.27	8	...	.....	.....	.....
Denver, Col.	...	...	639	3	..	..	....	....	.....	.....	.....	347,761.74	..	2,383	272,530	5,216	7,186
Des Moines, Ia.	278	79	357	..	..	..	317	317	22,698.00	68,622.00	91,320.00	91,320.00	2	....	74,900	.....	4,541
Duluth, Minn.	90	156	246	1	3	..	....	242	56,887.61	59,240.08	116,127.69	.....	2	611	122,400	4,084	4,697
Elmira, N. Y.	51	58	131	..	..	..	....	....	13,465.50	9,785.29	23,150.79	.....	3	...	.....	.....	.....
Fitchburg, Mass.	81	98	179	..	..	..	179	178	17,048.04	3,924.40	20,972.44	20,443.04	..	195	20,550	2,600	2,176
Galveston, Tex.	35	172	207	..	..	..	....	207	55,471.24	7,657.70	63,128.94	48,470.10	2	144	41,600	1,718	1,200
Haverhill, Mass.	87	187	274	4	..	..	181	181	16,831.84	26,738.19	43,570.03	41,220.29	..	...	.....	.....	.....
Harrisburg, Pa.	68	59	127	1	..	..	119	112	190,091.31	13,454.26	203,545.57	161,761.68	2	57	71,850	731	2,045
Hoboken, N. J.	80	93	173	1	2	..	173	172	141,729.89	30,889.45	172,619.34	171,695.21	..	...	.....	.....	.....
Indianapolis, Ind.	568	541	1,109	5	1	..	1,065	....	.....	.....	203,000.00	.....	4	1,654	341,810	21,674	22,730
Jersey City, N. J.	...	...	594	11	4	..	....	....	.....	.....	519,054.00	511,464.00	..	...	.....	.....	.....
Johnstown, Pa.	55	6	61	3	1	..	70	57	138,092.00	13,700.00	151,792.00	54,987.00	4	...	.....	.....	.....
Kansas City, Mo.	925	428	1,353	12	..	..	1,280	1,207	280,878.67	523,829.59	13,535,770.57	747,758.26	10	807	286,200	7,800	.....
Louisville, Ky.	772	134	906	21	8	3	....	772	.....	.....	339,846.69	339,846.69	3	718	.....	.....	.....
Los Angeles, Cal.	305	266	571	8	..	..	502	488	.....	.....	180,173.00	.....	..	...	188,150	2,999	12,193
Lynn, Mass.	206	260	466	4	..	..	464	461	3,708.25	9,382.17	13,090.42	132,980.54	..	...	.....	.....	.....
Lowell, Mass.	155	291	446	3	2	..	433	430	203,036.57	27,202.31	230,238.88	223,585.02	3	1,460	87,350	4,676	9,259
Little Rock, Ark.	18	199	217	..	..	..	115	104	99,724.47	112,109.06	211,834.53	109,739.78	..	165	67,541	1,766	1,246
Minneapolis, Minn.	...	...	1,156	13	12	33	....	183	192,244.44	264,256.22	456,500.66	376,295.66	14	...	527,250	30,112	25,112
Manchester, N. H.	105	179	284	2	..	..	....	....	29,373.33	22,043.12	51,416.45	39,379.95	1	...	108,885	2,379	7,210
Malden, Mass.	118	42	160	1	..	..	148	89	14,777.00	8,265.00	23,042.00	23,042.00	..	94	950	650	1,808
New Orleans, La.	349	228	595	15	3	..	527	452	.....	.....	583,558.00	.....	..	...	.....	.....	.....
New Haven, Conn.	129	222	351	3	..	..	351	350	50,530.15	37,766.84	88,296.99	71,358.59	..	604	55,400	2,375	3,590
Newton, Mass.	113	203	316	7	1	..	279	116	27,190.64	45,332.31	62,522.95	78,352.95	1	1,081	105,750	4,231	3,901
New Bedford, Mass.	97	140	237	1	..	..	228	197	8,358.88	4,978.06	13,336.94	.....	..	...	.....	.....	.....
Oakland, Cal.	150	115	265	2	1	..	....	262	57,453.57	69,805.17	127,258.74	99,957.74	..	785	145,955	6,640	.....
Omaha, Neb.	65	364	429	4	1	2	384	....	121,229.00	472,837.00	594,066.00	555,513.00	..	...	.....	.....	.....
Philadelphia, Pa.	810	2,541	3,251	7	20	11	3,160	....	706,787.00	1,619,741.00	2,326,528.00	.....	..	...	.....	.....	.....
Peoria, Ill.	196	123	319	..	..	1	302	284	31,664.00	105,224.00	136,888.00	136,888.00	..	1,410	156,875	4,543	3,212
Providence, R. I.	442	531	973	8	1	..	....	....	89,288.00	123,019.98	212,307.98	173,193.90	..	...	.....	.....	.....
Portland, Me.	109	190	299	3	1	3	295	290	121,187.67	137,350.84	258,538.51	125,554.23	3	...	.....	.....	.....
Reading, Pa.	48	49	97	..	..	..	95	....	13,622.19	21,759.90	35,382.09	.....	1	...	.....	.....	.....
Rockford, Ill.	121	26	147	..	1	..	147	147	11,478.75	4,857.17	16,335.92	15,980.22	..	...	39,350	.....	2,680
St. Louis, Mo.	1,639	861	2,500	37	14	1	....	....	506,673.00	782,168.00	1,288,841.00	1,050,831.00	16	...	.....	.....	.....
San Francisco, Cal.	777	521	1,298	35	7	1	1,246	1,134	405,154.35	1,257,003.29	1,662,157.64	1,096,825.38	..	...	.....	.....	.....
St. Paul, Minn.	216	275	491	21	4	3	....	....	101,374.00	165,766.00	267,140.00	267,140.00	..	1,917	162,178	8,207	245
Syracuse, N. Y.	174	140	314	3	2	..	288	287	108,835.98	87,824.13	196,660.11	194,144.11	..	509	111,150	5,200	.....
Salt Lake City, Utah.	...	...	182	..	..	..	....	....	.....	.....	398,608.46	.....	..	...	.....	.....	.....
St. Joseph, Mo.	252	59	311	..	..	..	....	305	14,427.00	21,567.00	35,994.00	33,759.00	2	...	.....	.....	.....
Scranton, Pa.	143	123	266	7	2	4	266	256	54,952.75	73,014.91	129,967.66	127,967.69	2	505	58,495	1,151	2,527
Savannah, Ga.	88	175	263	1	..	..	198	180	17,538.00	76,137.90	93,675.90	.....	..	...	.....	.....	.....
Spokane, Wash.	81	199	280	..	..	..	169	165	48,240.00	70,328.65	118,568.65	93,754.27	..	430	63,300	2,950	3,910
Salem, Mass.	87	78	168	..	3	..	....	....	.....	.....	49,767.57	49,767.57	..	...	36,500	2,483	2,262
Sioux City, Ia.	37	149	186	..	..	..	162	161	12,778.36	17,739.70	30,518.06	24,358.85	..	146	48,700	847	1,550
Superior, Wis.	41	92	133	1	2	1	133	132	.....	.....	76,693.36	73,401.36	1	...	.....	.....	.....
San Antonio, Tex.	..	...	147	..	..	..	100	99	.....	.....	.....	.....	..	...	.....	.....	.....
Topeka, Kan.	135	28	163	..	..	..	163	163	9,416.09	7,926.42	734,251.00	12,998.51	1	...	.....	.....	.....
Toronto, Ont.	484	383	867	..	..	..	372	372	86,904.86	186,791.84	273,696.70	219,058.70	..	...	.....	.....	.....
Toledo, O.	234	367	601	3	4	..	452	451	77,239.16	117,664.89	194,904.05	176,329.05	4	1,753	328,450	9,982	7,200
Taunton, Mass.	86	100	186	2	3	1	180	....	40,711.17	67,769.61	108,471.78	100,232.05	..	275	43,300	2,287	5,727
Troy, N. Y.	164	136	300	5	..	..	300	296	.....	.....	.....	.....	4	256	.....	.....	.....
Tacoma, Wash.	72	150	222	2	1	..	....	....	64,387.65	245,168.50	309,556.15	233,096.15	..	964	45,700	866	743
Utica, N. Y.	109	70	179	..	..	..	164	164	16,295.70	18,735.08	35,030.78	23,490.78	1	111	30,650	.....	3,700
Vancouver, B. C.	...	...	105	..	..	..	89	88	.....	.....	75,125.00	43,573.00	..	...	.....	.....	.....
Washington, D. C.	449	370	814	9	4	4	757	728	.....	.....	157,261.00	.....	6	451	197,450	8,789	3,981
Worcester, Mass.	254	557	811	3	2	..	776	770	91,312.19	176,730.05	268,042.24	231,165.84	..	730	100,300	7,521	13,370
Waterbury, Conn.	94	40	134	..	..	..	89	88	13,965.18	20,142.34	34,107.52	32,847.79	..	...	28,950	1,318	958
Wilkesbarre, Pa.	86	16	102	..	..	2	91	90	36,037.00	45,431.00	81,468.00	.....	..	58	30,500	546	2,641
Wheeling, W. Va.	78	113	191	..	..	..	191	191	11,491.54	16,700.96	28,192.50	.....	..	...	.....	.....	.....
Winnipeg, Manitoba.	...	...	518	..	..	..	....	....	.....	.....	170,160.19	.....	..	185	69,550	2,002	.....
Yonkers, N. Y.	121	146	267	6	5	4	254	254	64,314.54	51,250.23	115,564.77	94,249.77	..	423	51,450	3,792	3,469
Youngstown, O.	89	210	299	..	..	..	299	268	44,849.36	61,408.69	106,258.05	103,381.05	..	1,398	50,025	3,719	2,677
York, Pa.	26	51	77	2	1	..	76	75	14,369.40	34,031.40	48,400.80	32,608.87	1	140	27,800	284	4,385

WHAT POLICE AND FIREMEN ARE DOING

Rubber Tires Save Fire Apparatus—Charleston's Small Loss from Fire—Statistics of Other Departments—Fire and Police Personals

Fire Loss Small in Charleston

THE average loss from fire in Charleston, S. C., during the ten years Chief O. G. Marjenhoff has been in office amounted to 55 cents per capita per annum. The total loss for 1903 was $28,850.35, nearly $5,000 less than the average loss for the ten years. The number of alarms was forty-four more than last year, having been 189 and four of these were calls for assistance out of the city. Twenty false alarms were turned in. The promptness with which the alarms were sent and the equal celerity with which they were answered kept the loss down in spite of the large number of fires. During the year a second-size Metropolitan steamer was added to the service, making the apparatus in use ten steamers, a double tank chemical engine, seven hose wagons, five hose carriages, an aerial truck, two other trucks, two fuel wagons and twenty-one extinguishers. There are thirty horses and 11,700 feet of hose in good condition. The consolidated emergency wagon did good service with its foreman and linemen of the railway company, for they responded to every alarm and protected the firemen from electric currents. The expenses of the Department for the year were $52,600.

Rubber Tires Recommended for Apparatus

THE year's work of the Fire Department of Syracuse, N. Y., is told completely in Chief Quigley's report. The Department attended 314 fires, twenty-five of which were extinguished by engines, 106 by hydrants, and sixty-six by chemicals. The uniformed force numbers 139, divided among ten engine, two combination, one water tower and four truck companies. The apparatus for these companies consists of ten steam fire engines, nine hose wagons, three combination hose wagons, four trucks, a water tower, a supply wagon, five chief's wagons and as many sleighs, three exercising wagons, two sleighs for the trucks and nine for the hose companies. In reserve are held a chemical engine, two hose wagons, and an old-style truck. Sixty-nine horses are in service and four in reserve. The hose in use amounts to 17,400 feet, a small amount for twelve wagons. During the year one third-size Metropolitan engine, two hose wagons, a supply wagon, and a chief's wagon and sleigh were purchased. Chief Quigley recommended that a couple of engine houses be erected as well as some hose towers, and 10,000 feet of hose. The fire alarm telegraph system should be radically changed. The installation of a salvage corps has been considered by the Chief and he is thoroughly convinced that it would be a paying investment for the city. A new hose wagon should be obtained, a combination company should be located in the manufacturing district and that two more hand extinguishers should be carried on the trucks as they are a very valuable equipment in incipient fires. Rubber tires were recommended for several of the pieces of apparatus because of the slippery asphalt pavements. The rubber tires will overcome this trouble and the saving on the apparatus from wear and tear would soon pay for the improvement.

Good Work of Newport's Fire Force

THE houses and apparatus of the Fire Department of Newport, R. I., were all in good condition, with one or two exceptions, and the force was under good discipline. Good work confined the fires that occurred to the buildings where they started. The manual force of the Department numbers 141 callmen and fifteen paid men, who have charge of five steam fire engines, three hose reels, a truck, and there is an emergency company. There are thirteen horses in service and eight extras for use in winter. The hose on hand consists of 9,500 feet of wax-treated, 900 feet of cotton, and 750 feet of rubber, or a total of 10,250 feet. The number of hydrants in service is 276, and the fire alarm boxes, forty-one. The Department responded to 104 alarms and the total loss for the year amounted to $52,690.29. The Board of Fire Wards recommended that 2,000 feet of hose, two alarm boxes, and twelve hydrants be obtained.

Fire Force of Old American City

THE report of Chief Rhodes, of the Fire Department of the old city of St. Augustine, Fla., contained a number of recommendations. He thought that larger appropriations should be made for the maintenance of the department; that the firemen should be paid more, in order to secure the best men, and that the volunteer companies should be paid a fixed sum each year, instead of so much for every alarm of fire. He reported that the fire alarm system has been contracted for, and was about ready to be installed.

In his report of statistics, it is shown that there were fourteen alarms of fire during the year just closed, with insurance involved amounting to $6,300. The amount of insurance paid was but $447.91. The expenses of the department for the year are $1,248.96 for salaries, including that of the chief; $700 for the volunteer service; $220.88 for feed; $1,308.34 expended on the chemical engine, and $120 for rent for the stations.

Statistics about Fort Worth's Department

THE annual report of Chief Maddox of the Ft. Worth, Tex., Fire Department presented a number of interesting statistics relative to the Department and the city. The population of the city is about 40,000, and it covers an area of seven square miles. The number of alarms was 186 and all but six of the fires were confined to the buildings in which they originated. The total value of property involved in fires included $500,000 in buildings and $200,000 in the contents of buildings. The total insurance on prop-

erty on which claims of loss were made was $357,590 on buildings and $125,200 on contents, showing a total of $482,790. The total insurance loss on buildings is given at the very small sum of $14,919.08 and contents $7,203, showing the total insurance paid to be $22,122.08. The total loss on insured and uninsured buildings amounted to $16,511.08 on buildings and $8,138 on contents, a total of $24,649.08. The direct losses on buildings and contents in which fires originated are shown to be $21,232.88 and the losses on buildings and contents in which fires did not originate, including exposures, etc., $2.416.20.

Fire and Police Personals

—Mayor Cullum, of Duluth, Minn., has appointed Mr. C. H. Troyer for chief of police.

—Mayor Eastham, of Lynn, Mass., has reappointed the entire police force, including Chief of Police Thomas M. Burckes.

—Deputy Chief Joseph E. Shaw, of the Massachusetts State Police, has been appointed Chief of that body in place of the late Chief R. R. Wade.

—William H. Bywater has been appointed Chief of the Salt Lake City, Utah, Fire Department, by Mayor Richard P. Morris and confirmed by the Council, in place of Chief James Devine.

—Chief William J. E. Stone, of the Worcester, Mass., Police Department, has installed a detective bureau in the Department, four men being assigned to this work from the uniformed force.

—Chief of Fire Department, E. S. Purdy, of Portage, Wis., favored the passage of a law compelling insurance agents to give information concerning the amount of insurance in case of fires. A combination wagon and 500 feet of hose were also recommended.

—As the result of discontent and alleged mismanagement in the Fire Department of Springfield, O., Chief Follrath was to be removed as soon as his successor could be fixed upon. Mayor Bowlus and the Board of Public Safety recently determined on this course.

—Chief of Police Gibson, of Salem, Mass., was quoted as saying that he would enforce all the ordinances of the city provided the Council would back him up, but that he would not attempt to do so without this assurance of support. Public sentiment seemed to be with the Chief.

—In his annual report, Chief of Police Charles R. Wright, of Syracuse, N. Y., recommended that the Bertillon system of measurements be introduced in his department, and that, in case compulsory gymnasium practice be reinstalled, newer and better apparatus be placed in the gymnasium.

—Chief D. T. Sullivan, of San Francisco, Cal., recently submitted a report to the Supervisors recommending that 320 hydrants and a large number of water mains are badly needed in the city. In most populous districts the means for saving life and property are primitive and the Chief fears a disastrous fire.

—Chief Klein of the Fire Department of Janesville, Wis., reported that two more men should be added to the six paid members of his department so that the apparatus could be handled properly. He said that often the call men did not hear the fire bells and their employers were not anxious to have the men answer alarms and so did not notify them. He recommended that a better alarm bell be installed, and that the overhead wires be put underground as they were a serious handicap on the firemen.

—Major B. F. Howard, chief of police of Richmond, Va., recently tendered his resignation to take effect June 30th. As his reason for resigning, Chief Howard stated that the citizens were criticizing the Board of Police Commissioners for retaining him in office, because of his age and inactivity. The Board accepted the resignation. Chief Howard entered the police force in 1865 and has served through all the various grades. The Board commended the work of the Chief, who asks for assignment to other work in the department which will, without doubt, be given him.

—Chief C. E. Murden, of the Fire Department of Portsmouth, Va., recently addressed the Council in regard to the serious situation as the result of poor water pressure on the city water mains. He said that either the water company must be compelled to give better pressure, or the streets to the water front must be opened so that the engines could pump salt water. As a practical illustration of his remarks, Chief Murden, unknown to the Councilmen, ordered an alarm rung in and when the Councilmen, who are members of the Fire Department, rushed to their duty, the Chief proved to them that the greatest height to which water could be thrown from a hydrant was not over thirty feet.

—In view of the rioting attending the strike in Waterbury, Conn., last year, Chief of Police Egan stated in his report a plan for quelling a like disturbance. If extra policemen had been called into service and at least two placed on each car, the rioting would not have occurred. Each city should have at least one officer to each 800 inhabitants. The system of having the mayor call on the sheriff and he, in turn, call out the troops, is cumbersome. This is an expensive proceeding and Chief Egan thinks that 100 policemen could have done all that the militia accomplished. The Chief's plan is to make use of the State police as follows: "Should the police authorities of any city have reasonable grounds to expect any serious disturbance within their jurisdiction, the chief of police of such city should request the immediate presence of the superintendent of the State police, and should the disorder assume such proportions as to necessitate the reinforcement of the local police, written request could be made upon said superintendent for such number of men as the local police authorities may deem necessary, and said superintendent should then immediately make written requisition upon the proper authorities of the various cities for the requisite number of men from their police reserves, to serve at the expense of the city requiring their services. Such is the plan that I would suggest, and if adopted, in my judgment, the county sheriff and State troops will never again be called upon to perform police duty in this State. Such service is obnoxious to the troops and is liable to engender prejudice against them in the minds of a large portion of the community.

"The plan is simple, lawful, economical, and I firmly believe would be thoroughly effective, for by it a uniformed police force of more than 500 men could be concentrated in any part of the State upon very short notice, and without detriment or expense to the cities furnishing the men."

LITERATURE ON MUNICIPAL TOPICS*

Reviews of Some Important Books—What the Magazines and Reviews Have to Say About Civic Affairs—Municipal Reports Received

Books

IT has been said that we are entering on an age of cement and concrete, and the great development along these lines would seem to support the statement. Reinforced concrete is one of the most important branches of the general industry and it is in this direction that much work and experimental study must be done before engineers can agree upon any theory, for there are many theories of concrete-steel. Contributions to the literature on this subject are always welcome, especially when they are made by experienced men who have given time and thought to careful experiments and have drawn deductions from the same in a guarded manner. The translation of Armand Considere's *Experimental Researches in Reinforced Concrete,* by Leon S. Moisseiff C. E., will certainly be welcomed by all interested in the subject. There will be many to quarrel with Mr. Considere's deductions, but the skill in experimental research which M. Considere brought to his study of reinforced concrete and which shows in his description of his work, will secure for him the most respectful consideration and will make his work of the greatest interest. This book is a compilation of a number of papers by M. Considere, classified as far as possible to make one coherent treatise. "Reinforced Concrete in Bending" is the subject of the first chapter. Chapter II takes up "The Deformation and Testing of Reinforced Concrete Beams," including the laws of deformation in compression and under a first tension load, with the effect of repeated stresses. The effect of the percentage of iron and the quality of concrete, of the longitudinal sliding of the reinforcing metal, and of the surrounding in which the concrete is placed, are also included in this chapter. Chapter III is devoted to "Effects of Changes in Volume of Concrete," Chapter IX to the "Tensile and Compressive Resistance of Reinforced Concrete," Chapter V to the "Resistance of Concrete of Shearing and Sliding," and Chapter VI to the "Effect of Cracks on Stresses and Deformations." The last paper, or chapter, takes up "The Compressive Resistance of Reinforced and Hooped Concrete," considering the behavior of both longitudinal reinforced and hooped concrete under different conditions. M. Considere is chief engineer of the Department of Bridges and Roads of France, and has given the last six years to experiments in reinforced concrete. Cloth, 188 pages, tables, $2. m.

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The 1904 *Year-Book* of the Albany Chamber of Commerce is interesting as showing what has been done by that progressive civic organization for the improvement of the city. By keeping everlastingly at it the Chamber has been able to make the name of Albany known the country over. The Chamber has got in touch with over 1,800 concerns that contemplated changing their factory locations and, after investigation, endeavored to persuade the good ones to come to its city. In the work of keeping the streets clean, the committee having the matter in charge has decided on a campaign of education by causing articles to appear in the papers from time to time, to have the teachers speak to the scholars at least once a week about throwing paper on the streets and defacing buildings, etc., with chalk, and to place a circular letter in every house, asking the occupants to be careful about throwing things on the street; a letter to every business house, asking that no matter be allowed to accumulate in front of their places, and that they caution their employees about this. Distributors of handbills were to be asked to see that the "dodgers" be placed inside the houses and not thrown on the stoops. Another thing to be pushed during the year is the passage of an ordinance compelling ash gatherers to have tight covered wagons.

An important work accomplished by the Chamber of Commerce was the cleaning of the Albany Basin by dredging, removal of old piling and old hulks, repairs of docks, etc. The Chamber has investigated every complaint of citizens concerning transportation lines, and has accomplished much in bettering both freight and passenger transportation. The number of excursions and conventions continues to increase, due to the advertising of Albany by the Chamber, which sees that printed matter concerning the attractions of the city is placed in the hands of visitors. Under the direction of the Secretary, Mr. William B. Jones, many other things were accomplished during the year 1903.

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A handbook has been issued by Hon. Clinton Rogers Woodruff, secretary of the National Municipal League, North American Building, Philadelphia, covering the years 1894 to 1904. It contains a historical sketch of the League since its organization in 1894, a list of the meetings and the programs of them, the publications of the League, authors of papers read at the meetings, a list of officers and the constitution and by-laws.

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The Significance of Bacteriological Methods in Sanitary Water Analysis, by C. E. A. Winslow and C. P. Nibecker, of the Biological Laboratory of the Massachusetts Institute of Technology. Boston: The Authors, paper cover, 13 pages.

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Technical Mechanics, by Edward R. Maurer. An engineer's text-book of mechanics. Cloth, 382 pages, 300 figures, $4. w.

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American Meter Practice, by Lyman C. Reed. The reading of electric meters. Cloth, 196 pages, 78 figures, $2. m.

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Disinfection and the Preservation of Food, by Samuel Rideal. With an account of the chemical substances used as antiseptics and preservatives. Cloth, 494 pages, 22 figures and tables, $4. w.

* Any book or periodical reviewed or mentioned in THE MUNICIPAL JOURNAL, or elsewhere, will be sent to any address on receipt of price.

Periodicals

THE issue of *The Surveyor* of London contains a description of *London Main Drainage* and the opening of the Chelsea pumping station. It tells of the enlargement of the sewer system of London to prevent the pollution of the Thames River by sewage. Price per year, $4.75.

The concluding portion of *The Belmont Filtration Works*, by John W. Hill, appears in the March issue of the *Journal of the Franklin Institute*. This describes the filters for Philadelphia's water supply at this place. A number of illustrations accompany the text. Philadelphia, Pa., price $5 a year.

Light Railways in Greater London is the title of the leading article in *The Municipal Journal* of London for February 19. It describes the municipal street railway scheme at Barking and the bascule bridge, the first of the kind in England. Price per year, 8s. 8d.

A brief sketch of the *Baltimore Fire* and a discussion of the results appears in the *American Review of Reviews* by Joseph M. Rogers, with illustrations of some of the burned sections. William J. Fryer contributed *Baltimore's Lesson for Other Large Cities*, drawing the conclusions that a larger fire force, wider streets, better water supply, better building regulations, more hydrants, and the placing of wires underground, etc., are the improvements that are necessary in this city. New York, N. Y. Price per year, $2.50.

The Great Northern and City Tube Railway is the title of an article in *The Engineering Times*, of London, Eng. It describes the opening of the new line, the methods of driving tunnels, the power stations, etc. Price per year, $2.25.

Charles Zueblin writes about *Greater New York* in the February *Chautauquan*, in which he discusses briefly the work done by the different civic organizations for the improvement of the city and citizens. Springfield, O. Price per year, $2.

The Canadian Engineer for February has an editorial on *Municipal Ownership of Public Utilities*, which speaks strongly in favor of municipalities owning and operating those natural monopolies where competition cannot exist to advantage. It defends public ownership against the stock arguments of those who are interested in private corporations which have secured franchises from the public. Toronto and Montreal, Can. Price per year, $1.

The March issue of the *World's Work* contains the fourth article by Adele Marie Shaw on school systems, this time the city of Menominee, Wis., having received her attention. *The Ideal Schools of Menominee* describes what Miss Shaw considers the best public schools in the world. Her conclusions are: "1. Measured by the actual demonstration of what public schools can be, most other public school work is dead and inefficient. 2. The value of the Menominee schools as an object lesson is due more to the thought than to the money expended on them. 3. If communities were willing to spend both money and thought, they would receive a hundredfold for their expenditure." New York, N. Y. Price per year, $3.

Eye-bars or Cables for Manhattan Bridge, by R. S. Buck, *Railroad Gazette*, New York, December 4, 1903.

Engineering Design of the Williamsburg Bridge. L. L. Buck. *Railroad Gazette*, New York, December 25, 1903.

A Desirable Method of Dredging Channels Through River Bars. Proceedings, American Society of Civil Engineers, December, 1903. New York.

Electric Pumping Plant at Mobile, Ala. Illus. *Engineering Record*, New York, January 30, 1904.

Smoke Prevention, by R. P. King. *Engineering News*, New York, January 28, 1904.

An Example of Thin Macadam Road Construction Along the Charles River, Mass., by J. Albert Holmes. *Engineering News*, New York, January 14, 1904.

Philadelphia's New Fire-Fighting Service. Iron Age, New York, January 21, 1904.

Making Cement Roadways in Richmond, Ind., by H. L. Weber. *Engineering News*, January 28, 1904.

Paving Brick for Street Railway Track. Engineering News, New York, January 28, 1904.

Concrete Foundations and Cement Filler for Brick Pavements: A Comparison of Natural Cements and Portland, by O. L. Gearheart. *Engineering News*, New York, February 4, 1904.

Sewage Purification. An informal discussion. *Transactions*, Amer. Soc C. E., New York, Vol. 51.

Report on Garbage Collection and Disposal at St. Louis, Mo. Engineering News, New York, January 14, 1904.

Rubbish Incineration in New York City, and the Design for the New Stanton Street Incinerator. Illus. *Engineering Record*, January 30, 1904.

The Wear of Sewer Inverts, by E. A. Hermann, C. E. *Engineering News*, New York, February 4 1904.

Concrete Building Blocks. Engineering Record, New York, January 30, 1904.

Raising Water by Compressed Air, by Percy Griffith, C. E. *Minutes of Proceedings*, Inst. C. E., London, Eng., Sup., Vol. 154.

A Freer City: A Plea for Municipal Home Rule, by Clinton Rogers Woodruff. *Yale Review*, February, 1904.

Labor at the Edinburgh Gas Works. W. R. Herring. *Journal of Gas Lighting*, London, Eng., February 2, 1904.

Gas and Electric Statistics Compared for the United States. Progressive Age, New York, February 15, 1904.

Protection of Steel from Rust by Concrete, by Charles L. Norton. *Engineering News*, New York, January 14, 1904.

Some Municipal Works in Egypt, by W. Noble Twelvetrees. *Public Works*, London, Eng., January 15, 1904.

Asphalt Deposits of Trinidad, by Henry Louis. *Public Works*, London, Eng., January 15, 1904.

Municipal Turin, by E. Anfione. *Public Works*, London, Eng., January 15, 1904.

Municipal Gas Works of Amsterdam, by J. Van Rossum du Chattel. *Public Works*, London, Eng., January 15, 1904.

Municipal Sydney, by W. M. Gordon. *Public Works*, London, Eng., January 15, 1904.

DECISION FAVORS BITULITHIC

Missouri Supreme Court Decides That Specification of Warren Pavement Does Not Violate Charter of St. Louis

The Supreme Court of Missouri, Court of Banc., October term, 1903, has handed down the following decision in the case of Wm. H. Swift, appellant, vs. the city of St. Louis, et. al., respondents:

This is an appeal from a judgment of the Circuit Court of the city of St. Louis dissolving a temporary injunction which had been obtained in this cause and dismissing the bill. The suit was one in equity against the city and the Board of Public Improvements to enjoin the said Board from making a contract for the pavement of West Pine Boulevard with "bituminous macadam" under City Ordinance No. 20,822. This suit is based upon the alleged invalidity of said ordinance providing for said pavement.

Section 27 forbids the Assembly to specify directly for such work or improvements contemplated by the charter, or to fix the price or rate therefor, but in all cases, except in cases of emergency work or necessary repairs, the Board shall prepare and submit to the Assembly ordinances with an estimate of cost thereof endorsed thereon, authorizing the doing of any proposed work, and under the direction of such ordinance shall advertise for bids in the papers doing the city printing three times, the last publication to be at least ten days before the day appointed for the opening of the bids, stating the general nature of the work to be done and time and place when the bids shall be received, and shall let the contract to the *lowest responsible bidder*. Any other mode of letting out or contracting for work shall be held illegal and void.

On June 3, 1902, the said Board at a regular meeting selected "bituminous macadam" as the material for the reconstruction of said street, and by a resolution approved and recommended to the Municipal Assembly an ordinance for the reconstruction of West Pine Boulevard between Spring avenue and Kingshighway Boulevard, known as Ordinance No. 20,822, with bituminous macadam.

It appears that ninety-two property owners on this boulevard petitioned for bituminous macadam and twenty-four for rock asphaltum. Among the specifications of material to be used in the reconstruction of the street it was required that the pavement should be of certain composition prepared by one Warren and known as "Warren's Puritan Brands," to-wit, Warren's No. 1 bituminous semi-liquid composition," "Warren's Brand," and "Warren's No. 24 Puritan Brand," and "Warren's quick drying bituminous flush-coat composition."

Briefly stated, the pavement should be laid and composed of crushed stone, that is, macadam and the bituminous composition designated above as the binding material.

"The ordinance provides for a foundation of clean crushed stone coated with a thin layer of Warren's No. 1, and on top a heavy coating of Warren's No. 24 brand. On this foundation is laid the wearing surface or pavement proper, composed of carefully selected sound hard crushed stone (granite or porphyry) ranging in size from two inches in diameter to an impalpable powder, mixed with sand and containing all sizes and grades, so that the material in the aggregate shall contain the least amount of voids. The proportion must be determined to the satisfaction of the Street Commissioner by special laboratory examination of the ingredients used."

The ordinance then provided after heating the stone, for its separation through a rotary screen into at least four sizes, and for the mixing of these grades of stone with another Warren composition known as Warren's Puritan Brand No. 19. The bituminous concrete thus formed is spread on prepared foundation to a depth of two inches; over this is spread a thin coating of another Warren composition, to-wit: Warren's quick drying bituminous flush-coat composition, "the purpose of this coat being to thoroughly fill any unevenness or honeycomb which may be on the surface of the coarser mixture."

Fine sand is then worked or squeezed into the surface, and into the surface is then rolled the coarser sand for the purpose of presenting a gritty surface which will not be slippery. "The use of stone chips or cement for this purpose shall be determined by the Street Commissioner."

The blank form and contract and specifications for bituminous macadam proposed to be used by the Board in the event of the adoption of that class of pavement were filed in the office of the Board of Public Improvements according to Mr. Varrelmann, the street commissioner, before the hearing of the Board. In the published notices no reference is made to the Warren mixture.

The petition alleges that the ordinance was void for the following specific reasons:—

"First, that it arbitrarily deprived the land owners of the benefit of competition, in that bituminous macadam was not an original composition, but well known composition of an original material made up of broken stone and any bituminous substance used as a cement or binder. That the Warren materials specified were not patented articles, and were nothing but certain grades of coal-tar branded with Warren's name, and that the specifications thereof precluded competition and designated Warren and his associates as the sole bidders, and that this arbitrary specification was in violation of the rule of competition prescribed by the charter.

"Second, the ordinance did not specify all the material with which said bituminous macadam should be composed, nor did it fix the manner and general regulations under which it should be constructed, as required by the charter, but left the entire composition thereof other than the arbitrary selection as aforesaid of the Warren mixtures, to the discretion of the street commissioner, and thus unlawfully delegated the power and authority of the Board to the street commissioner.

"Third, that the public notice did not state or warn the property owners that the bituminous substances to be used as a cement should be those produced and controlled by Warren, designating the pavement simply as 'bituminous macadam,' which name did not imply or suggest the designation of any specific manufacturer's brand of binding material."

The petition also alleged that bituminous macadam was an untried experiment, and had never been demonstrated by efficient use for a series of years that such pavement would constitute an efficient wearing surface under city traffic; that the Board had advertised for bids for a contract under the ordinance and would enter into a contract and issue special tax bills against plaintiff's property unless restrained by the Court.

The answer admitted the ordinance and their proposed making of a contract thereunder as alleged and that said proceedings were in all things regular; and that there was only one pure waterproof macadam which had been tried or tested and that this was a pavement composed of the Warren mixtures, that the specifications were as full and complete as the nature of the subject would admit.

I. It is conceded by the learned counsel for the plaintiff that this Court in Asphalt Co. vs. Hunt, 100 Mo., 22, held that the city of St. Louis under its charter was not prohibited from letting a contract for paving a street with materials covered by letters patent; that to hold otherwise would be to deprive the city of the right to enjoy the benefits of modern invention. When that question was again raised in Verdin vs. The City of St. Louis, 131 Mo., 26, the Hunt case was reaffirmed and the doctrine as to patented material, was extended to a material whereof the owner had a monopoly by reason of his exclusive ownership of the natural supply of such material.

As was said in the latter of those two cases, so many contracts had been entered into on the faith of the decision of this Court in the Hunt case, that it had practically become a rule of property and that it was too late to disturb that ruling. But it is insisted that those cases went too far, and while the Court might not disturb them on the principle of *stare decisis* they ought not to be extended

because to do so would strike down the last protection of the abutting property owners against discrimination and favoritism in contracts for public improvements, which are made a charge *in invitum* against the private citizen. The insistence is that the facts of the case do not bring it within either the principle of a governmental patent nor yet within the Verdin case, a monopoly based upon the ownership of the only source of supply of a natural product, but it is a designation by the Board of Public Improvements, and ratified in the ordinance by the Municipal Assembly, of certain brands of a certain manufacturer of a well known mercantile article, preparations of coal tar, and in so doing the Board and the Municipal Assembly deprived the tax-payers of all the benefit of competition which the charter secured to them in the letting of public work.

On the other hand, the city maintains that its Board of Public Improvements and its Municipal Assembly are vested with the power to determine the character of street improvements and the courts will not undertake to interfere with the discretionary powers of its officers within legal bounds; that when a city in the prosecution of a public work finds an article or material which in its judgment is best adapted to such work, it is not debarred from availing itself of it because such material is controlled by one party. The Circuit Court dismissed the bill and held that the city authorities were authorized to specify Warren's Brands of coal tar cement, as the binding material in the construction of a bituminous macadam pavement.

After a careful reading of this record we gather that, for many years, pavements have been made of coal tar and coal tar productions, but the difficulty encountered was the inequality of the tar preparations, and we think the burden of the proof was that coal tar cement properly made is a most excellent binding for macadam; that it resists water when properly made. A notable case is of a pavement laid in Washington City thirty years ago and which is still in excellent condition, but it had been discontinued by contractors because of their inability to get a uniform quality sufficient for any considerable amount of work. But the evidence tends to prove that the Warren Brothers, of Cambridge, Mass., by continued effort have succeeded in making a uniform coal tar cement; that while others dealers in coal tar productions might produce a cement of uniform quality as a matter of fact they have never done so, and at the time West Pine Boulevard was to be reconstructed there was no other company or individual except Warren Brothers making a satisfactory coal tar cement.

There was then this condition confronting the Board of Public Improvements and Municipal Assembly when they came to decide what material they should adopt for the reconstruction of West Pine Boulevard. The bituminous macadam had the advantage over asphalt pavement in that horses were not liable to slip and fall on it, especially in cold weather. It was sufficiently strong, owing to the rock in its composition, to carry great weight and the coal tar cement was impervious to water, and would make an enduring pavement. A large number of other cities were using it to advantage. They were desirous of testing it, but they were advised that the only proper binding for the macadam known up to that time was the Warren's cement, and accordingly they required that cement in the specifications submitted.

The main contention of plaintiff is that, by so specifying Warren's Brand, they have prevented competition and thus violated the charter. This question is by no means a new one. While the learned counsel for plaintiff urges that coal tar is a common article of merchandise and that the specifications should not have been limited to Warren's Brands of Coal Tar Cement, we think the proofs demonstrated that up to this time there was only one such cement so made as to be equal and uniform. How, then, can it be said that in adopting the only proper cement known for the binding in a bituminous macadam pavement, the Board exceeded its authority any more than it would have done if it had adopted an asphalt pavement and specified Trinidad Lake Asphalt as the material.

This Court approved the Trinidad Lake Asphalt specification in the Verdin case, because the monopoly therein resulted from the ownership of the whole natural supply of that article. Can it make any material difference that that supply in this case is the result of a long and persistent effort to produce a uniform cement? In each case the owner has the only material which the city desires to use. Having held, as this Court has in the Hunt case, 100 Mo., 22, and in the Verdin case, 131 Mo., 22, that the city is not precluded from using the best material because it is a patented article or a monopoly which denied competition, how can it be consistently ruled that it cannot use another equally desirable article because only one firm manufactures it? It is not answered by saying other persons might produce it. They have not done so, and a public improvement is not to be delayed to await the pleasure of other persons to experiment and see whether they can produce the proper materials. But it is insisted that the Board and Municipal Assembly might have accomplished the same result by selecting a cement of the standard of the Warren Company. In other words, knowing there was no other proper and uniform coal tar cement made except that of the Warren Brothers, they could have fixed theirs as the standard. Would it not at once be said, and properly so, too, that they might as well have specified Warren's Brand directly as to have done so by indirection? In case of Schoenberg vs. Field, 95 M. A., 241, it was properly ruled that, when the Board of Public Improvements arbitrarily selected vitrified brick of a certain make when the Board's own records disclosed that other manufacturers made brick of the approved standard, it was a denial of competition and void. In this case we find from the evidence that there was but one known manufacturer of coal tar cement of equal and uniform quality, and that was made by Warren Brothers. Had the evidence disclosed that other manufacturers made a coal tar cement suitable for binding the rock in the macadam, we think it would have been the duty of the Board to select a standard of such cement and require bidders to conform to that standard and provided proper tests, but where, as in this case, the whole supply is owned by one company or individual and it is the only suitable article for the public improvement, we see no reason for denying the city the right to avail itself of it, if we are to adhere to our former decisions permitting the city to use patented articles and materials in which one party has a monopoly by the ownership of the material supply.

II. As to the objection that the specifications did not call for coal tar cement in so many words, but named Warren's Puritan Brands, the evidence clearly indicates that all the contractors understood fully that these brands were coal tar cements.

III. The notice to the property owners to consider the improvement we think was a substantial compliance with the charter, referring as it did to the specifications on file in the office of the Board and the street commissioner. Nor was the ordinance void because it left certain details to the discretion of the proper city officials. The evidence disclosed that such details amounted to an infinitesimal proportion of the work.

In consideration of the whole record we think the judgment should be and is affirmed. Robinson, C. J., Brace, Marshall & Valliant, J. J., concur; Fox, J., dissents; Burgess, J., absent. Jas. B. Gantt, J.

From Ojibway to Korea

THE *Four-Track News* for April opens with a timely article on Korea, entitled "With the Hermits," from the pen of Kirk Munroe; "Where Sheridan Was a Boy," by Clement L. Martzolff, is an interesting pen-picture of the early life of "Fighting Phil"; "Charming Chautauqua" is a prettily written description of that lake and its surroundings, by Will Larrymore Smedley; "Snow Caps," by Day Allen Willey, is a brief article on mountain climbing in the Canadian Rockies; Laura B. Starr tells something of the life on house-boats in different parts of the world; "The Tunneled Rock of Perce" is an intensely interesting stretch of life among the fisherfolk of Chaleur; Isabel R. Wallach contributes an article on "The Metropolitan Museum"; and Martha Lowell tells something of the "Byways of Japan"; "Back of the Backwoods," by Charles Howard Shinn, treats of the life of the Indians of the Sierra Nevadas; "Ojibway Land," by Martha Craig, is a picture of Indian life on Temiskaming; "After Ducks in Mexico," by Leland Howard Ives, is an article to delight the reader who enjoys hunting; S. M. McCowan tells of the American Indian exhibit at the St. Louis Fair, and N. S. Olds writes of the battle of Lundy's Lane; Jane W. Guthrie devotes two pages to the coming Cincinnati musical festival,

and H. Perry Smith tells of "Champlain's Two Expeditions." In addition to these articles there are the usual departments, full of interesting and valuable facts, several "Little Histories," together with poetry and humor rounding out a very complete Table of Contents.

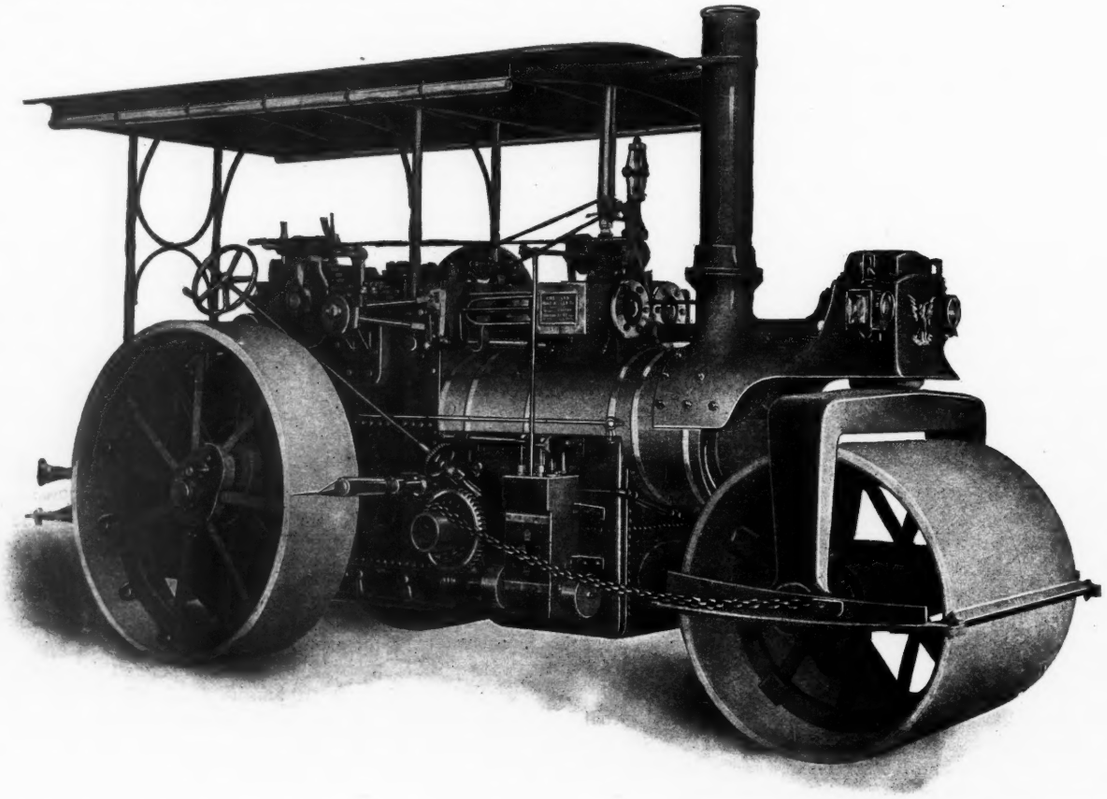
The *Four-Track News* is fifty cents a year, or five cents a copy, and can be had of George H. Daniels, Publisher, 7 East 42d street, New York.

Improved Steam Road Roller

An illustration of an improved steam road roller, manufactured by the American Road Roller Company at its works at Groton, N. Y., accompanies this article. The addition of a steam steering engine, as simple as it is effective, has been made and the trouble usually encountered in steam steering devices, has been modified by the careful methods employed of simplifying the various parts.

In the construction of this new roller, care has been taken to equalize, as far as possible, the weight of the machine on the rear and forward wheels, thus giving an almost equal pressure on the road being rolled. The scheme adopted in some rollers of putting a large portion of the entire weight of the machine on the rear wheels, acts prejudiciously on the new roadway and causes a deep-set line to be formed by the heavier wheels, which line is hard to get rid of. It is advisable to construct traction engines with all the weight possible on the rear wheels, for the purpose of gaining tractive power, but to apply this arrangement to a steam roller is wrong and prejudicial to complete success. In this new roller, hammered steel axles and countershafts are used; crucible steel pinions take the place of open hearth steel; as an improved sliding sleeve, which does away with all "feathers," has been substituted for the old plan. Compensating steel gear can be applied to these rollers whenever deemed advisable, and this useful addition enables the machine to run easier and turn sharp corners with great facility.

The makers claim that, "throughout the machine a far better class of brasswork, injection valves, water gauges, etc., has been fitted to this new roller than can be found in other rollers, and the efficiency of the improvements named has placed this road machine on an equality with the best locomotive practice." The American Road Roller Company's officers are at 156 Fifth avenue, New York City.



"Get Out of the Old Ruts"

It is said that over one billion dollars have been spent during the last fifty years for the improvement of the public highways, yet only 1 per cent. of the million and a half miles of roads of the United States are now improved.

"What is the matter?" one asks. To which the Steel Highway Track Construction Company of America, 758 Drexel building, Philadelphia, replies: "The road builders must get on the right track. This is easily done by adopting the same methods and material used by the builders of the railways, viz., a steel track for their heavily loaded, metal tired vehicles to travel on; something which will not rut and wear out; something to protect the vital part of the road.

"The first cost of such a road is no more than a stone road. It needs practically no repairs and, besides, there will be neither dust nor mud. Traveling, either by carriage, automobile or bicycle, will be made the essence of pleasure."

This company will be glad to send descriptive catalogue to any one desiring it.

The Winget Concrete Block Machine

The Winget Concrete Machine Company, of Columbus, O., is putting out what is claimed to be a perfect machine for the manufacture of concrete blocks for dwellings, bridges, docks, retaining walls, tunnels, subways, foundations, gutters, copings, etc. It is claimed by the company that the machine is automatic and adjustable, making possible a combination of ten machines in one. The following important features of this machine are set forth:

1. It is automatic, the mould being formed and the moulded block released by the simple revolution of a gear.
2. It is adjustable. It makes blocks of various widths, heights and lengths.
3. It makes blocks 4, 8, 9, 10, 12, 14, 16, 18 and 20 in. in width.
4. It makes blocks any length from 2 to 32 in., as may be desired.
5. It makes blocks with plain, tooled, beveled, highly ornamental and rock-face by simply attaching the proper facing plate.
6. It makes blocks for octagon angles for curved fronts, inner rock-faced angles and many special designs to suit the requirement.
7. The wing-faced plates being forced positively and accurately into position insures clean, solid, sharp, and rectangular corners to the block.

8. The blocks can be made partly solid and partly hollow.

9. The cores are removable so as to make solid and extra strong blocks when necessary, or other cores may be substituted to make smaller or hexagonal openings.

10. The blocks are so arranged that a continuous column extends from the ground to the roof and supports the joists, the ends of which are entirely surrounded by concrete.

11. The hollow spaces form flues which are clear and free from bottom to top so as to be used for hot air or stove flues or for ventilation, eliminating any foul or damp air.

12. The joists being placed 16 inches from center to center enables the use of building material in regular lengths.

13. The ends of the blocks have plain surfaces, thereby insuring solid closed and lasting joints.

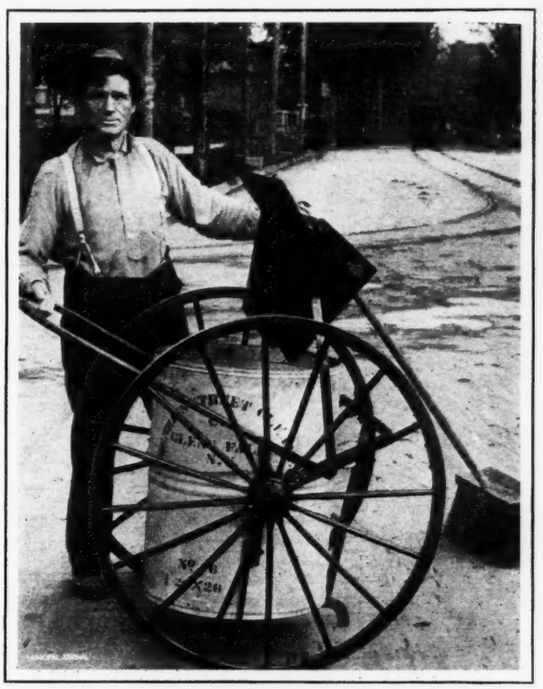
14. Its capacity is the greatest of any machine on the market, because it is automatic and simple.

15. The rocking of this machine through 45 degrees admits of facing and filling to make a great variety of richly colored, moisture-resisting and at the same time inexpensive stone.

By addressing the company, a catalogue telling all about this machine will be forwarded.

Menzies "New Model" Street Cleaner

In previous issues of the Municipal Journal and Engineer we have described and illustrated models of the Menzies street cleaner. In this issue we show the new model cleaner, which has many advantages over the old style. The old model had a small wheel at the back of the cart; the new style does away with this. The new machine has a locking device by which the handle is fastened when the machine is moved. With one motion, and without loss of time, the locking device can be shifted, allowing the handle to be used for dumping the dirt from the dust pan into the can. The locking device does away with the little wheel, thus removing a part that wears rapidly, that is liable to catch in car tracks or similar obstructions, and that makes considerable noise. These objections to the little



EMPTYING PAN

wheel apply to the use of the cleaner on rough pavements; on smooth paving the objections are not material.

The new model machine can be readily propelled in any direction and on any kind of pavement. These machines are made to hold cans twenty inches in diameter and twenty-six inches high. Bags may be used with the machines and an attachment to hold the bags is furnished for that purpose. The machines weigh about eighty pounds. It is claimed that a man can clean 50 per cent. more

SWEEPING DIRT INTO PAN

street surface with this machine than with any other contrivance on the market, except horse or power machines. The time consumed in shoveling dirt into the can is saved by this cleaner and the shovel and scraper are dispensed with. The cleaner is neat, strong and durable, and, with proper care, will last for years. Address The Menzies Steel Cleaner Co., Glens Falls, N. Y., for illustrated folder.

Bitulithic Pavement for Augusta

The municipalities of the South are pushing to the front in the matter of public improvements. They are quick to discover a good thing in any line of civic improvement and quick to adopt it, provided it stands the scrutiny of their careful and painstaking investigation. Mayor R. E. Allen and Commissioner of Public Works Nisbet Wingfield and Messrs George Howard and William Dunbar, according to the Augusta *Chronicle*, recently visited several Southern cities where the bitulithic pavement has been laid and returned with their brains fairly reeling under the weight of facts and figures on the worth of bitulithic. Continuing, the *Chronicle* said:

"These gentlemen formed Augusta's paving quartet which went to Birmingham to see with their own eyes, as one of them has expressed it, how the pavement is put down, what the people who have used it think of it, and how it looks after the wear and tear of years. Bitulithic paving appears to us to be a good thing. We find that it has given satisfaction where it has been used, and while not prepared to commit ourselves to it unreservedly, we think that it certainly ought to be considered when the question of repaving Broad street comes up for final settlement.

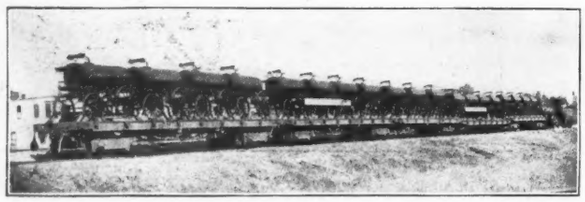
"Mr. Dunbar said that the committee was splendidly entertained in Birmingham. Mayor Drennen and the superintendent of public works as well as others of the municipal officials did everything that could please their guests and afford them facilities to see what they wanted about the paving now being done in Birmingham. He said the Augustans were carried everywhere, the rolling mill being one of the places of interest visited.

"As to the bitulithic itself, Mr. Dunbar said that it makes a surface as soft almost as asphalt, with the advantage that it does not become slippery. In color it is similar and after the first few weeks is not more dusty than the present asphalt covering of Broad street was before it got full of holes.

"The mayor and Mr. Wingfield parted from the confrères in Birmingham, going on to Nashville to see how this kind of street looked after it had been under the wear and tear of a city's travel for some years. Nashville has been a user of the bitulithic for a long time and furnished ocular demonstration of the proof of the claims made for it by its manufacturers. Mr. Dunbar said that it had been the aim of the committee to hear what the users of the stuff had to say about it, and not what the makers claimed. They wanted proofs and not assertions."

AUSTIN STREET SWEEPERS AND SPRINKLERS

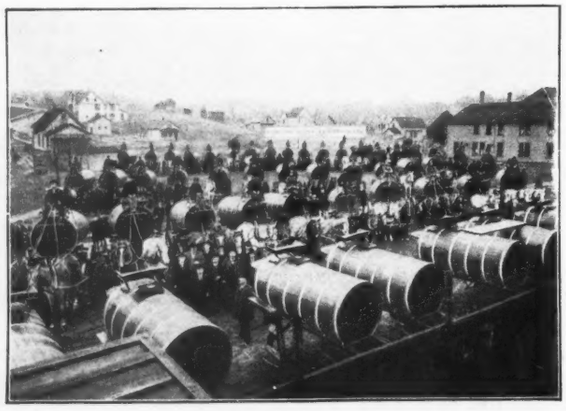
"SOLD by the train-load" is one of the slogans of the Austin-Western Co., Ltd., of Chicago, which handles the Austin sprinklers and sweepers. As a proof of this assertion, the accompanying photographs are offered by the company. The fact that these sprinklers are sold by the train-load is proof that the machines are a success wherever used and that, after one is tried, more are sure to be ordered when the need arises. Some of those who have tried the Austin sprinkler and ordered more are: The United States Government



TRAINLOAD OF SPRINKLERS FOR NEW YORK

for use on the streets of Washington, claimed to be the cleanest city in America, and for use in Yellowstone Park, the roads of which are sprinkled almost exclusively by Austin machines; Greater New York; all the other large cities, which are continuously adding to their stock of sprinkling wagons by consignments from the Austin-Western Company.

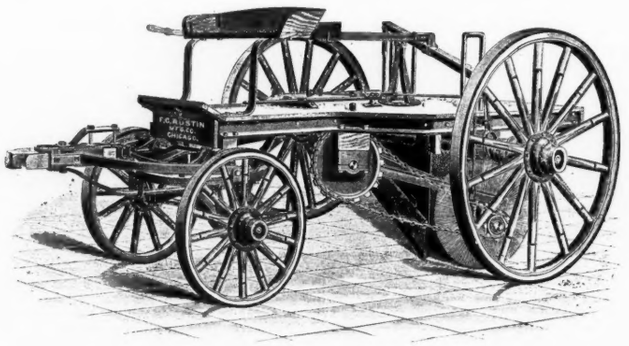
There are a number of good points about the Austin sprinklers to be noted. The wheels are fitted with overhanging tires and so arranged that the front wheels can turn under the frame, enabling the shortest possible turn to be made, an advantage on a narrow city street. The axles are made of steel, are of the Concord pattern, and



TRAINLOAD OF SPRINKLERS FOR ST. PAUL

have taper sprindles, with oil groove and solid collar. The springs vary in size according to the size of sprinkler, and are guaranteed to have a factor of safety of five times the load they are intended to carry, thus ensuring a long life to this important portion of the wagon. The gear is of the special Austin design and is fitted with an under truss which adds greatly to the durability and strength of the wagon. An oscillating fifth wheel is fitted to the gear, allowing one wheel to drop into a rut or pass over an obstruction in the road without sprinkling the tank. A great trouble with most sprinklers is that they are made with wooden frames, which soak up the seepage from the tanks and rot. The frames of the Austin sprinkler are made entirely of structural steel and, therefore, will not absorb water and rot. Nor is it possible to bend or break them. The tanks themselves may be made of steel or wood as the purchaser desires. The wood in the one kind of tank is Louisiana tide-water red cypress. Each stave is fitted with dowell pins and white-leaded when the tank is built, ensuring practically water-tight joints. Either flat bottoms are used or the tanks are made in horse-shoe pattern. The steel tanks are securely riveted and properly caulked. The Austin sprinklers are made in six sizes and seven styles to suit every requirement.

On any sprinkling wagon the sprinkler valve or head is of immense importance. Those used in these sprinklers are noted for the ease with which they can be instantly adjusted to give either a heavy or light spray. A simple movement of the driver's foot determines what the spray shall be, without the manipulation of any springs, dogs, or other contrivances. When the valves become clogged, they can be flushed by moving the same lever that regulates

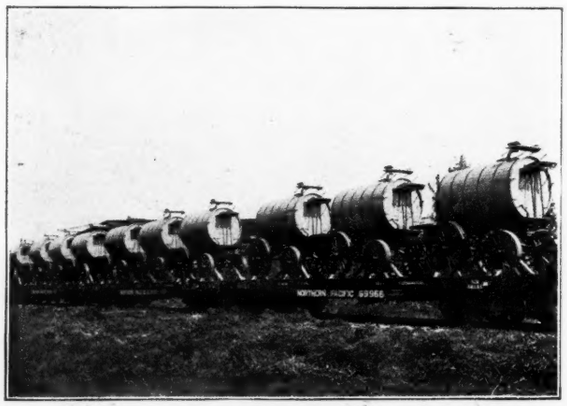


AUSTIN SPECIAL STEEL STREET SWEEPER

the spray. The spray is discharged at right angles to the wagon. The valve is composed of but two parts and its simplicity renders it almost incapable of getting out of order. Each spray can be operated independently of the other.

Small towns will find the style of sprinkler equipped with a double acting hand force pump of especial advantage, for two men can throw a stream from the wagon to the second story of a building, and thus the wagon can be used in case of fire. The pump also enables the driver to fill the tank from a brook.

In the Austin street sweeper the city official secures one of the simplest, strongest, and most durable machines made. The power



TRAINLOAD OF SPRINKLERS FOR YELLOWSTONE PARK

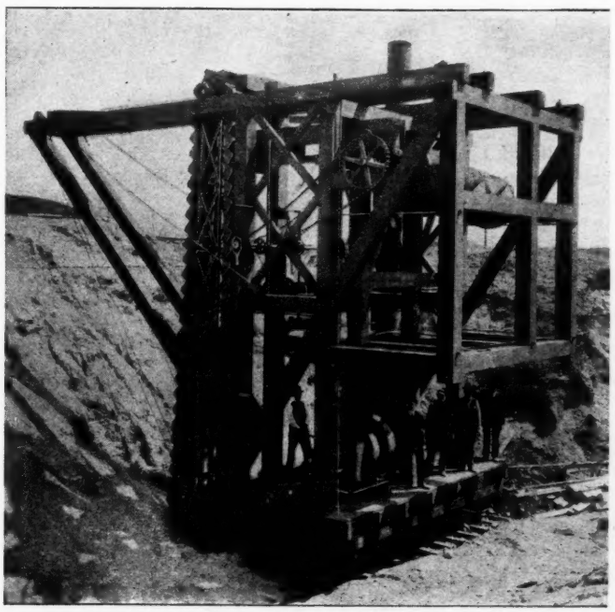
is carried from the main axle to a counter shaft by a pair of heavy bevel gears and the broom is turned by a sprocket chain connecting with this shaft. The broom is raised or lowered by a single lever, and the machine is thrown out of gear by a lever operating a simple spring clutch. Nothing could be simpler as there is nothing to get

out of order. Channel and tee steel are used throughout, consequently strength and light weight are assured. The main axle is of three-inch cold rolled steel. The wheels are large and heavy and a steel guard rail on the curb side protects from injury. There are few parts to wear, the moving parts are kept well oiled by automatic grease cups and the absence of cogs and many sprocket wheels makes breakages few and far between.

"Triumph" Sand and Gravel Digger

A NEW machine has been put on the market, one used for handling large quantities of material, which is sure to attract the attention of contractors all over the world. It is known as the "Triumph" automatic combined sand and gravel digger, elevator and grader. It was designed and constructed by The C. O. Bartlett and Snow Company, of Cleveland, O.

There has long been a demand for a specially designed machine which would reduce the cost for excavating or digging, for elevating or grading sand and gravel, and this new machine appears to fully meet the demand.



The machine is entirely self-contained, being mounted on heavy car trucks geared to the engine which is mounted near the center of the lower platform.

First, the railroad track is laid along parallel with the bank to be excavated. The digging is done by specially heavy steel buckets, provided with special teeth, fastened to a very strong chain and all supported by a self-contained elevator leg pivoted at the head end, thus allowing the lower end to be gradually forced into the bank by means of heavy cables attached to the bottom of the elevator leg and running up over sheaves at the outer end of the projecting arm of frame, then down to a drum which is geared to the engine shaft. By this means, the lower end of the elevator can be gradually forced into the bank, digging and elevating the material up to an angle of 70 degrees. In other words, commencing at the bottom and gradually digging its way up. The heavy steel buckets dig the gravel, sand, or similar material, and elevate it as fast as dug, discharging it at the top onto a belt conveyor which delivers it to a revolving screen on the opposite side from the elevator. The screen can be fitted to furnish as many sizes of sand and gravel as desired. From the screen the different grades are delivered direct to bins (not shown in cut) located under the screen. These bins are situated high enough to allow a gondola car underneath and receive the material directly from the bins.

While the elevator is in operation the entire machinery can be propelled by its own power along the track forward or backward as may be desired, for any distance.

The controlling mechanism is conveniently located, so that one man can control every motion from one platform; also watch the operation at the same time.

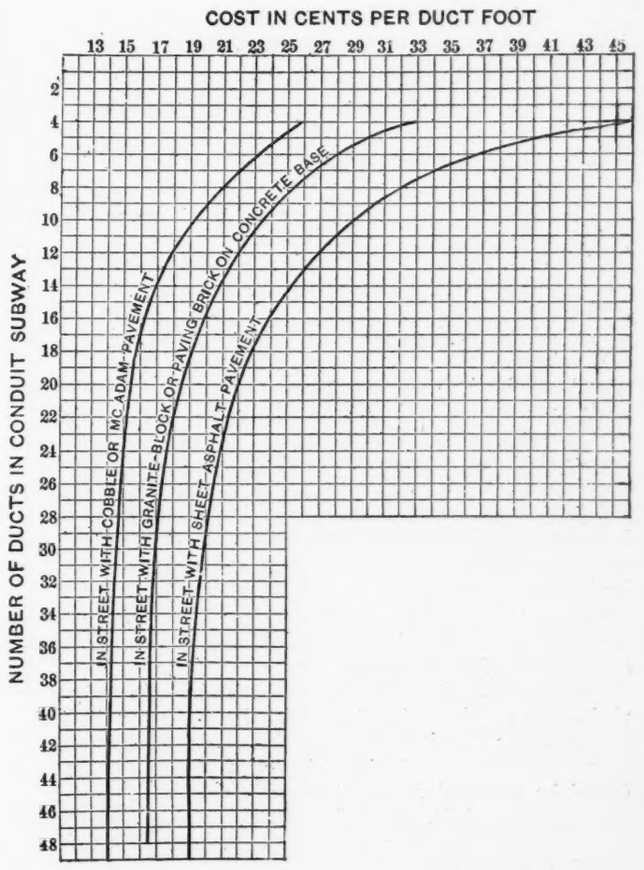
This machinery will work successfully on any material that can be handled with pick and shovel and can be built to any gauge of track, and can be made of almost any capacity desired.

This particular machine has a capacity of 30 to 40 yards per hour, and all the necessary machinery is operated by a 25 h. p. boiler and engine.

In some places, it is necessary to strip the bank before reaching the good gravel. To accomplish this, there is a belt conveyor, not shown, built over the top of the machine, which projects far enough on the bank side to enable the poor material to be shoveled directly onto it, conveying it across the machine, delivering it 25 ft. beyond on the opposite side, where the gravel has already been dug away. There is also a conveyor arranged for taking the real fine dirt or dust which the screen takes out, delivering it with the strippings.

Cost of Conduit System

AT first the public demand for placing electric, telephone and telegraph wires underground was confined to the larger cities. Very soon the smaller cities followed the example of the larger municipalities and now the towns are taking up the question, and in many places insist that all wires within certain districts shall be placed underground. For this reason the interest in the general subject has become widespread, and is considered even more by the laymen than by the engineers. Mayors and Councilmen in many small cities and towns are interesting themselves in the elimination of the overhead wire evil, and therefore anything which will simplify the statement of the problem will be of value.


COST IN CENTS PER DUCT FOOT
13 15 17 19 21 23 25 27 29 31 33 35 37 39 41 43 45
NUMBER OF DUCTS IN CONDUIT SUBWAY
2 4 6 8 10 12 14 16 18 20 22 24 26 28 30 32 34 36 38 40 42 44 46 48
IN STREET WITH COBBLE OR MC ADAM PAVEMENT
IN STREET WITH GRANITE BLOCK OR PAVING BRICK ON CONCRETE BASE
IN STREET WITH SHEET ASPHALT PAVEMENT

Mr. C. J. Field, of 29 Broadway, New York City, manufacturer of the well known Field Clay Conduits—multiple and single—has recently put out a small illustrated folder containing information

which will be of interest to everybody. Judging from his experience he says: "For towns and small cities a 3-inch bed of concrete in bottom trench and a 3-inch concrete cover is all that is required in the construction of subways. For large cities a concrete envelope should be constructed around the conduits with bottom four inches thick and three inches on sides and top. Mix the concrete one part Portland cement and two and a half parts sand, five parts ¾-inch stone, gravel or furnace slag.

"As to the cost of a conduit system a table (see illustration) giving approximate cost under average conditions in our large cities has been worked out for the class of pavement generally found, and includes trench conduits, concrete and repavement. The results given will be found of service in the preparation of estimate and checking them up."

Those interested can secure further information by addressing Mr. C. J. Field, 29 Broadway, New York.

Advantages of Assyrian Asphalt Filler

One of the most important parts of a brick pavement is the filler and, therefore, the readers of the Municipal Journal and Engineer will be interested in a description of the filler manufactured by the American Asphaltine & Rubber Co., of Chicago. This filler has been used in Grand Rapids, Battle Creek, Bay City, and Ann Arbor, Mich., Lima and Cincinnati, O., and Minneapolis and St. Paul, Minn., and has given entire satisfaction.

The advantages claimed by the makers for this Assyrian asphalt filler are briefly these: "That genuine natural asphaltine retains its oils, hence its lasting qualities. At a temperature of say 96° F., coal tar fillers would flow into the gutters, but this temperature would have no effect upon Assyrian asphalt. In extreme weather coal tar pitch would become very hard and brittle, and under travel would be ground to dust and be blown away. The tough and fibrous nature of Assyrian asphalt and its high melting points are the qualities which recommend it for use as a cement for filling paving blocks. Samples of Assyrian asphalt, hardened by a temperature of 33° F., did not yield to several blows struck with a hammer, having a resistance more like lead. Tar cracked and many small splinters flew by one light touch of the hammer.

"This is claimed by its makers for this filler, because it will not run in summer, nor become brittle in winter, nor disintegrate; in addition, it is impervious to frost and water, it is also impervious to street liquids, and on grounds of sanitation it is, therefore, desirable, as no filth can fill up between bricks. As the asphalt filler adheres to the block, it gives elasticity to the pavement, and noise and jarring are materially reduced by its use.

"The reverse of all this is true of coal tar, or any adulterated and inferior class of asphalts, cement grouting, etc., hence it is that many engineers, turning from all such, prescribe sand filler, being cheaper and just as unsanitary. Cement grouting invariably breaks away from the brick, is swept or blown away, and the interstices then fill up with everything objectionable; there can be no serious argument for its employment, and none for those other "fillers" which are fillers in name only. *Their cost represents that much lost to property owner and city, and their failure incidentally shortens the life of the brick instead of extending it.*

"The standard vitrified brick is water proof only as long as the vitrifaction remains—when broken off by traffic the brick absorbs moisture, etc.; then it is that the value of a good filler shows up—pour our filler around the brick, be liberal with it, and the troubles caused by 'swelling' from moisture will not be extended over the pavement as a whole. The value of this can be readily appreciated. Why then employ a filler which does not accomplish this or anything else of value?

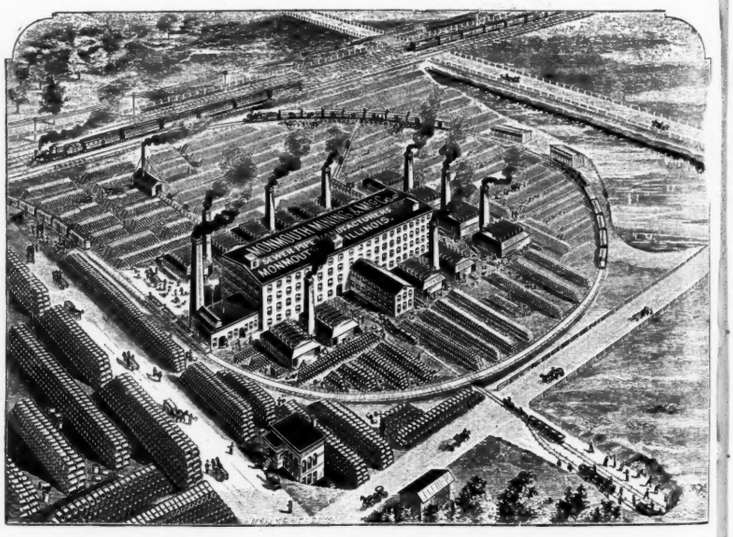
"This question of 'filler' is as important as the selection of the brick and having a filler which fills all engineering and sanitary requirements and being unquestionably the superior of any other, it is worthy of recognition by city engineers in their specifications, thus affording us an opportunity to, at least, compete with others, and with this object in view we shall be pleased to submit samples, prices and data.

"One ton of asphalt filler equals about 250 gallons or 200 square yards at one and one-fourth gallon to the yard. A gallon of filler weighs about eight pounds or about 25 per cent. less than a gallon of coal tar pitch."

"Time to Use Sewer Pipe"

Thirty-two years ago the manufacture of drain tile, sewer pipe and other clay products was begun by the Monmouth Mining and Manufacturing Company at Monmouth, Ill., and the experience born of these years has made the product of this company second to none. The material from which these products are made is mined on the company's land adjoining the factory and the supply is practically inexhaustible. The shale and sand rock are obtained at a depth of 100 feet below the surface and are mined as is coal. The vein is from twelve to fifteen feet thick and the material vitrifies thoroughly when subjected to an intense heat, taking an excellent salt glaze.

The plant, shown in the accompanying illustration, is a four-story brick building equipped with the most modern machinery. It has a capacity of 2,500 car loads per annum and, as the raw material is obtained from below the surface of the ground, frost does not interfere with the operation of the plant, which runs winter and summer.



VIEW OF PLANT OF MONMOUTH MINING AND MANUFACTURING CO., MONMOUTH, ILL.

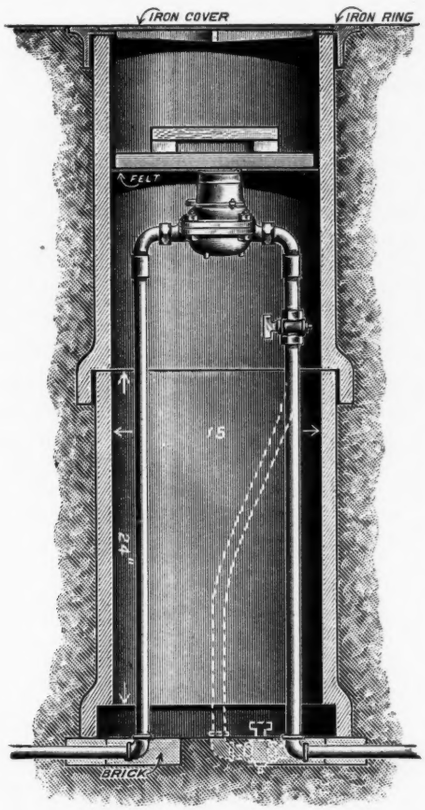
Most of the large sewer contracts throughout Illinois, Iowa and neighboring States are supplied with material from this plant and a large stock is maintained so that reasonably large orders can be filled at short notice. The shipping facilities of the company are excellent, the main lines of four large railroads touching the city.

The company was organized by the late William Hanna, well-known to clay-workers throughout the country, and his son, Mr. J. R. Hanna, now has general direction of the business. The general manager, Mr. A. W. Gates, C. E., personally supervises the plant.

Space will not permit an enumeration of all the clay products of this company, but they include all sizes of both Standard and Double Strength sewer pipe from three to thirty inches in diameter, drain tile, flue linings, wall coping, fire brick, sidewalk brick, chimney tops, and a long line of special goods. A request to the Company will bring a catalogue showing all that the company manufactures, with price lists and discount tables.

A New Meter Box Cover

A SERIOUS trouble met with by all water departments is the freezing of meters when set at the curb or outside the house, yet it is an advantage to have the meters outside of the house to prevent possibility of tampering with them on the part of the householders. It is to do away with the freezing trouble that the Buffalo Meter Company has put on the market its iron cover and ring for use with the tile meter curb box, experience having shown that when the meters are protected in this way, little or no freezing takes place.



During the winter of 1902, according to Water-Works Superintendent E. W. Bemis, of Cleveland, O., not a meter used in this style of setting froze, although others not so set did freeze.

This ring and cover is made of cast-iron and weighs about seventy pounds. It is coated with black asphaltum and the top is cross checked to prevent slipping when stepped on. For the curb box ordinary fifteen-inch vitrified clay or cement sewer pipe may be used. The box should extend below frost line so as to allow the warm air of the earth to enter it and, if necessary, the air chamber can be extended two or three feet below the level of the service pipe by using brick or an extra length of tile.

As shown in the cut, a wooden frost cover, fourteen and one-half inches in diameter can be used, with wooden cross cleats and handle on the upper side and the under side covered with a sixteen-inch circle of one-fourth-inch saddler's felt. In many cases neither the wooden cover nor felt is necessary. If the curb cock be already in place, it may be left at the bottom of the curb box and the pipe bent as shown by the dotted lines in the illustration.

Price lists and full details of these covers, as well as of American and Niagara meters, may be obtained by addressing the Buffalo Meter Company, 290-296 Terrace, Buffalo, N. Y.

Publications Received

—The Decarie Manufacturing Company, of Minneapolis, Minn., has just issued an attractive brochure in a fine coated paper with green ink. It talks about plants in operation, things that have been accomplished, with the incinerators built for the cities of Minneapolis, Johnstown, Pa., Spokane, Wash, Tampa, Fla., and elsewhere.

—The Haywood Wagon Company, of Baldwinsville, N. Y., makers of contractors' bottom and rear-end dump wagons and carts, asphalt and garbage wagons and carts, and stone spreaders, has revently issued an interesting "trade puller" in the form of a large, illustrated private mailing card. Besides using attractive half-tones of its plant it gives four views of its products, together with a few pertinent facts about each, enough to draw forth inquiries from those interested for fuller information.

—"The Money Making Mill" is the catch phrase on an attractive calendar sent out by the Kent Mill Company, 170 Broadway, New York. In striking letters at the bottom of the calendar is the query: "How much money would a Kent mill make for you? We can tell you, ask us! It grinds cement, clinker, quartz, limestone, phosphate-rock and other hard substances."

—The National Electric Company, Milwaukee, Wis., has just issued an illustrated 44-page catalogue, No. 60, which tells a convincing story about its alternating current machinery for lighting, power, and railway service.

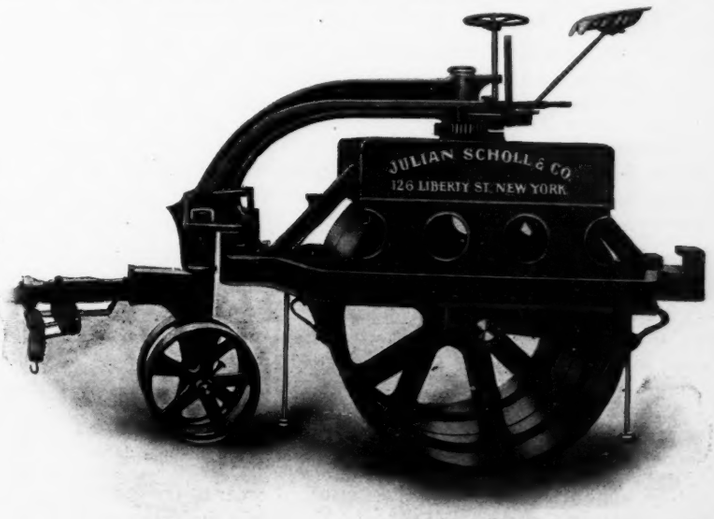
The Peerless "Pick-Up"

Economy and efficiency go hand in hand with the use of the peerless pick-up hand street sweeper, made by the Sanitary Street Sweeping Company, of Washington, D. C. While there has been a great deal of talk in the newspapers about the well cleaned streets of New York City, and while that city has been held up as a model for cleanliness—but never for economy—the city of Washington is not only a cleaner city than New York, but its street cleaning department is conducted in a more economical manner. One reason for this is found in the fact that it uses a large number of the peerless pick-up hand street sweeping machines.

According to the report of Street Superintendent Stutler, of Washington, the use of these machines saved nearly $16,000 the first year, which was several times the price of the machines, as compared with the cost of doing the same work by the old methods. Columbus, Ohio, and other cities have the same story to tell. Price-list and description of the machine will be sent on application to the Sanitary Street Sweeping Company, Washington, D. C.

A Practical Reversible Horse Roller

THE accompanying illustration shows one of the many machines for road work that have made the name of Julian Scholl & Co. known the country over. This machine is known as the "Standard Reversible Horse Roller," and has been manufactured for many years by this company. The machine has proven to be a practical roller and the high quality of the iron of which they are made accounts for the lasting qualities for which they are known. The roll is in two sections, loose on the axle, which is stationary, being held tightly in boxes on the steel frame. This axle thus serves to tie the frame



together and adds to its strength. The other advantage of the loose rolls is that the roller can be used as a non-reversible if desired. The sectional roll, because the sections turn independently of each other, allows the roller to move easily around a corner, while if the sections were fixed on the shaft the roller would be stiff and difficult for the horses to manage.

The main frame is made of steel channels and projects but three inches beyond the rolls, thus permitting of close work by trees, curbs, or poles. There are no weak parts to get out of order in the simple reversing arrangement. The small wheels in front have wide faces and support the frame, thus taking the weight off of the horses, making the roller run easily and allowing perfect guiding. The front truck may be turned at right angles to the main rolls so that the team can turn in small space.

The rollers are built in three, four, five, and six-ton sizes and the diameters of rolls are fifty-four, fifty-six, fifty-eight and sixty inches. All have a width of fifty-four inches. Write Julian Scholl & Co., 126 Liberty street, New York, for further particulars.

Items of Interest About the Trade

—Mr. George Bancroft, Jr., well known throughout the West by his professional work as consulting engineer of the Stratton estate, as well as in other enterprises, has become associated with the Engineering Company of America, and will take charge of its department of mine management, with headquarters in Denver, Colo.

—The Commercial Railway Equipment Company, 120 Liberty street, New York, has recently put out a neat little blotter as an advertisement of its products. The company deals in new and second-hand equipment for railroads, power plants, contractors and others. A monthly list is issued which can be had on application.

—The most attractive route between Buffalo and Chicago is that of the Lake Shore & Michigan Southern Railway. It traverses the southern shore of Lake Erie, the scenery of which lends entertainment and enchantment, which makes the trip altogether too short. There are no weary and worn travelers on the Lake Shore. The "book of trains," which tells much about the route of the famous Lake Shore Limited will be sent to any address upon application to A. J. Smith, General Passenger and Ticket Agent, Cleveland, Ohio.

—The National Electric Company, successor to the Christensen Engineering Company, manufacturer of air brake and electrical machinery, has just moved its extensive offices and engineering department to its new building located at the works. The building is constructed of cement blocks and measures 200 by 66½ feet. Extensions and improvements in the shops are under way in order to facilitate the handling of the constantly growing business.

—Press dispatches announce the purchase by the Allis-Chalmers Company, the largest machinery manufacturer in this country, of the Bullock Electrical Manufacturing Company of Cincinnati. The Cincinnati plant will be devoted to the manufacture of electrical appliances and its management will not be changed.

—The John Kline Company, successor to the Buckeye Brick Company of Wickliffe, O., has recently been incorporated. The new concern will continue to manufacture the paving material known as "Buckeye Block."

—Superintendent Bemis, of the Cleveland Waterworks Department, has equipped all the water meters throughout the city with the Columbus Meter seal, made by the Columbus Meter Seal Company, Columbus, O. By the use of this device it is impossible to tamper with water or gas connections.

—The American Magnetic Fire Alarm Company, Toledo, O., recently installed one of its systems at New Philadelphia, O., and is now installing one at Barberton, O.

—The City of Cleveland has given a second order to the Sanitary Street Cleaning Company, of St. Louis, Mo., for its flushing wagons, which it used last summer with the utmost satisfaction. The ten new wagons will be put into service as soon as the season opens. In referring to their use last season Superintendent Gus H. Hanna, of the Cleveland Street Cleaning Department, said: "Both from a cleanly and a sanitary standpoint this system is the very best I have ever seen. So thorough is the work of these flushing wagons that by using them twice a week we have eliminated sprinkling in the downtown district. The merchants last summer told me that they saved ten thousand dollars in the district where the flushing system was used."

—L. C. Smith and Brothers, manufacturers of typewriters, Syracuse, N. Y., wish it distinctly understood that they have no connection, either directly or indirectly, with the typewriter trust, which is known as the Union Typewriter Company. While they were formerly the owners of the Smith Premier Typewriter, they are now making typewriters under their own name as an independent company.

—"Nordberg Engines" is the title of the bulletin for January, issued by the D'Olier Engineering Company, mechanical and electrical engineers, contractors and manufacturers, Philadelphia, Pa.

—The city engineer and others interested in building and paving materials will profit by reading the folder just issued by the Silicate Stone Company, 39 Wall street, New York. This folder contains a lot of valuable and up-to-date information in regard to the silicate of lime stone process as discovered by Mr. L. P. Ford, London, England.

Care of Cairo's Streets

ABOUT 60 per cent. of the streets of Cairo, Egypt, are cleaned and watered daily under supervision of the Sanitary Department, the remaining portion, known as the "Native Quarters," receives attention every four days. The total number of animals employed in this service numbers 420, and the necessary vehicles are made and repaired at the Government Arsenal. A large amount of work was done in 1901 in the way of road repairs and in the construction of new roads. The total area was then about 3,352,964 square yards, of which 1,642,817 square yards were paved. In 1901 26,000 square yards were macadamized with limestone, 66,520 square yards of old limestone roads were repaired with basalt, the total area of these latter roads at the end of the year being 377,862 square yards. About 116,000 square yards of basalt roads were repaired, a large area of macadam roads was rolled with a steam roller, asphalt block pavements received attention also, and 483,630 square yards of earth roads and foot-paths were leveled and about ten miles of curb were repaired. In 1902 a still greater amount of work of this character was done, but the amount necessary for this work this year was placed at $1,512,642 for macadamizing the whole area of Cairo's streets. In addition to paving, a number of streets require widening and some new streets are to be laid out.

The Public Works Ministry has charge, also, of the public gardens, squares and promenades. Trees are planted, pruned and watered and fountains supplied with water in these places, and a large nursery is maintained for the renewal of trees and plants. There are usually about 40,000 trees in stock. Nearly 100,000 trees are maintained, most of them of a variety known as lebakh, and these thrive finely, extending their branches a long distance over the walks in a short time after planting. As the sun is very hot and shines nearly every day in the year, these trees prove a great boon to the foreigner.

CONTRACT NEWS FOR THE MONTH

Including Paving, Sewerage, Water Supply, Lighting, Public Buildings, Sewage and Garbage Disposal, Fire Supplies, Contracts Awarded

N. B.—All news of proposed work sent us by city officials is incorporated in our Weekly Advance News Service and appears subsequently in this "Contract News for the Month" if the date of the reception of bids be sufficiently late to warrant placing the item here.

City officials and others are urged to send us all news of contemplated improvements for use in our Weekly Bulletins which are mailed to those interested.

PAVING, PAVING MATERIALS AND MACHINERY

Akron, O.—The paving of West Exchange street is contemplated.

Albany, N. Y.—Union street is to be paved.

Allentown, Pa.—It is said that Chew street is to be paved this year. Mayor Lewis.

Alliance, O.—An ordinance provided for the grading and graveling of Franklin avenue.

Altoona, Pa.—Bids were to be asked for brick paving. City Engr. Harvey Linton.

Asotin, Wash.—Bids are wanted April 4 for a county road. J. B. Bell, Clerk Board Co. Comrs.

Athens, Pa.—Will spend $40,000 for paving this year.

Augusta, Ga.—A turnpike to McCormick will probably be constructed.

Baltimore, Md.—It has been recommended that several streets be improved. St. Paul street to be widened to 160 feet; Pratt street to be 120 feet; Light street to be 102 feet; Hanover street to be extended, etc.

Beatrice, Neb.—W. Court street will be paved with brick or stone.

Belvidere, N. J.—Bids were to have been asked for macadam road.

Birmingham, Ala.—Morris avenue will be paved.

Boise, Ida.—A new road may be constructed for which a petition was granted.

Boston, Mass.—Temple street paving will cost about $66,000.

Braddock, Pa.—An ordinance provided for the improvement of Braddock avenue.

Brooklyn, N. Y.—Plans have been prepared for improving and extending Bedford avenue.

Calcutta, O.—Have issued $20,000 bonds to improve Calcutta road. J. J. Ausley, Township Clerk.

Charlotte, N. C.—South College street will be extended. City Surveyor Spratt.

Chillicothe, O.—Second street will be improved by paving and curbing.

Clayton, Mo.—Estimates have been prepared for opening and improving Pennsylvania avenue.

Collinwood, O.—Grandview avenue will be macadamized.

Colorado Springs, Colo.—Dale street may be widened.

Columbus, O.—Ordinance provided for brick and cement walks on Broad street.

Cornwall, N. Y.—State Road Commissioners have been surveying for road at Highland Falls.

Dayton, O.—Ordinance provided for bond issue for improving Forrest avenue.

Delaware, O.—East Winter street will be paved this spring.

Dennis, Mass.—Will raise the sum of $7,000 for paving purposes.

Denver, Colo.—Broadway is to be paved with macadam.

Des Moines, Ia.—The estimated cost of paving Twelfth street was placed at $12,800, and for East Seventh street at $6,000.

Detroit, Mich.—Considering the paving of Jefferson avenue.

East Pittsburg, Pa.—An ordinance provided for $75,000 improvement of Braddock avenue.

Erie, Pa.—Ordinances were passed providing for various street improvements.

Fort Smith, Ark.—It was proposed to macadamize 500,000 square yards and pave 50,000 square yards with brick. City Engineer Bayley.

Fort Wayne, Ind.—Bids are wanted April 7 for five miles of brick and asphalt paving to cost $240,000. City Engineer Randall.

Gloversville, N. Y.—Will lay 10,000 square yards of macadam and 2,100 square yards of wood block this season. City Engineer Vrooman.

Grand Rapids, Mich.—All bids for paving Grandville and Ellsworth avenues were rejected. Cost estimated at $9,610 for paving Crescent avenue. Will probably grade and gravel So. Fuller and Garden streets, and lay cement curb. City Clerk Boer. Considering the laying of brick on North Ionia street.

Hamilton, O.—A resolution provided for a cement curb and gutter on Walnut street. Buckeye street will be paved.

Hartford, Conn.—Estimated cost of street work for 1904 placed at $324,702.

Huntsville, Ala.—Madison County will spend $24,000 for road improvement this year.

Huntsville, Mo.—Will vote on bonds issue for macadamizing streets. The Mayor.

Hutchinson, Kan.—Bids are wanted on April 1 for paving West Sherman street.

Indianapolis, Ind.—Pennsylvania street will be paved with brick, and cement walks are to be laid on Bellefontaine street.

Ironton, O.—Park avenue will be paved with asphalt blocks.

Newark, N. J.—Newark plank road is to be widened to 100 feet.

Jopin, Mo.—Three streets will be graded and macadamized and Fourth street will be paved with brick.

Kansas City, Mo.—Plans have been prepared for grading, curbing and paving of Linwood Boulevard.

La Crosse, Wis.—Will lay twenty-four blocks of granite top macadam, and 17,000 square yards of brick paving.

La Grange, Mo.—Concrete walks are to be laid on Main street.

La Salle, Ill.—Will spend $170,000 for street improvements.

Lincoln, Neb.—Plans have been prepared for street paving.

Little Falls, N. Y.—Were to vote on March 29 on $40,000 bond issue for paving.

Lynn, Mass.—May issue $150,000 for street improvements.

McKeesport, Pa.—West Fifth avenue is to be paved.

Macon, Ga.—Will commence macadam work in April.

Madison, Wis.—It is said that Capitol and Park streets will be paved. Mills street will be macadamized.

Mankato, Minn.—Plans have been prepared for the improvement of St. Clair road.

Marion, O.—East Church street will be paved. Mayor Mader.

Mobile, Ala.—Bids are wanted April 6th for paving in the Third District. Bids April 20th for 73,200 square yards of asphalt, wood block and granite block pavement, with 58,000 feet of granite and concrete curb and 52,000 feet of brick paving. President Board of Public Works.

Montpelier, Ind.—Considering the paving of several streets.

Nashville, Tenn.—It is stated that $50,000 bonds for paving have been sold.

Natchitoches, La.—All bids for paving were rejected and new ones were to be asked, or the city will do the work itself.

New Castle, Pa.—Considering 2,700 feet of macadam road.

New Orleans, La.—Plans approved for paving Calliope street with block. Lopez street will be paved.

Norfolk, Va.—Belgian block will be laid on three streets.

Norristown, Pa.—Four miles of road will be built. County Coms.

Omaha, Neb.—Plans prepared for paving various streets.

Oshkosh, Wis.—Bids April 2 for grading, macadamizing and curbing on Evans street. M. Coffey, Chairman Board of Public Works.

Pasadena, Cal.—Washington street in North Pasadena will probably be widened.

Phœnix, Pa.—Estimated cost of completing Tonto road is $78,000.

Pittsburg, Pa.—Webster avenue will be widened and improved.

Port Huron, Mich.—Two streets are to be repaved. Superintendent Public Works.

Portsmouth, Va.—An ordinance provided for asphalting of Avon street at a cost of $4,000.

Rockaway Beach, N. Y.—A boulevard may be constructed.

Saginaw, Mich.—Plans have been approved for $292,988 worth of paving. Board of Public Works; W. H. Barton, clerk.

St. Joseph, Mo.—Will let contract this spring for paving.

St. Louis, Mo.—Lindell place will be reconstructed.

Salt Lake City, Utah.—City Engineer L. C. Kelsey wrote that the following improvements were contemplated: 40,000 square yards of asphalt paving on South Temple street, and 5,000 square yards asphalt on First street.

Santiago, Chili.—Bids July 1 for paving, water system and sewers. Chilean Consul General, 135 West Eleventh street, New York.

St. Louis, Mo.—Bids are wanted on April 5 for completing government road. Maj. Thomas Cruse, Dep't Q. M.

Savannah, Ga.—Much paving is contemplated for this season. An ordinance was introduced for brick on State street.

Scranton, Pa.—An ordinance provided for the paving of Monroe avenue. City Clerk Lavelle.

Seattle, Wash.—Estimated cost of grading Western avenue placed at $23,000. City Engineer Thompson. The paving of Occidental street will cost $69,500.

Southampton, N. Y.—$25,000 bonds have been issued to pave Main street.

Springfield, O.—Considering asphalt and brick paving for Lagonda street.

Sterling, Ill.—First avenue may be paved.

Stewartsville, N. J.—Warren County will build seven miles of macadam road.

Tacoma, Wash.—A resolution provided for improving North 30th street.

Tiffin, O.—An ordinance provided for paving, grading and draining Main street.

Toledo, O.—Have issued $5,250 road improvement bonds. City Auditor Bacon.

Toronto, Ont.—It is proposed to widen Gerrard street.

Vancouver, B. C.—Estimates have been made for the paving of Pendes street.

Vicksburg, Miss.—Bids were wanted for brick on Washington street. City Engineer Polk.

Walla, Walla, Wash.—About $20,000 will be spent on paving. City Clerk Reynolds.

Washington, D. C.—Vermont avenue will be extended and widened.

Wellston, O.—An ordinance provided for grading, curbing and brick paving on First street, Ohio avenue and Broadway. Mayor Jones.

Wilkinsburg, Pa.—Voted to issue $50,000 bonds for street improvements. Borough Secretary W. V. Jones.

Wilmington, Del.—Considering street improvements. Street Commissioner Pierson.

Winnipeg, Man.—Redwood avenue will be macadamized and curbed at $3,000.

Woonsocket, R. I.—Will ask bids for paving two streets.

Worcester, Mass.—Cambridge and Salem streets will be macadamized. Street Commissioner Hassam.

Wylam, Ala.—Various street improvements are contemplated.

Contracts Awarded

Allegheny, Pa.—Atlas Construction Company has contract for grading, paving and curbing on Hanover street at $2,985. International Company, for Broadway at $4,806.

Bay City, Mich.—D. J. Kennedy & Son have contract for brick paving at $2,784.47.

Bayonne, N. J.—D. Donovan has contract for paving West Thirtieth street, at $6,099.

Beaumont, Tex.—Contract awarded Myrick Bros. for paving several streets.

Bloomington, Ill.—O. W. Dunlap has contract for 5,238 square yards brick paving at $1.42 per square yard.

Brooklyn, N. Y.—E. D. Benedict was low bidder for walks and crub on Church avenue at $14,737.

Buffalo, N. Y.—E. D. Burgard was low bidder for paving Lutheran and Stevens street with brick. German Rock Asphalt Company bid lowest for asphalt on same streets.

Cincinnati, O.—Kirshner Construction Company has contract for asphalt paving at $32,776.

Cohoes, N. Y.—J. J. Dooley has contract for widening on High street.

Geneva, N. Y.—Thomas Fitzgerald, Fredonia, was low bidder for paving three streets with Corning block or macadam.

Harrisburg, Pa.—George B. Stucker was low bidder for 21,586 square yards paving at $1.83 per square yard for wire cut block and $1.90 for repressed block.

Hartford, Conn.—C. W. Tyron, Meriden, has contract for grading Danbury turnpike at $27,000. Seymour Clark Hills Company, Springfield, Mass., has contract for grading Dugway road at $5,471.

Hartford City, Ind.—Nolan & Slattery were low bidders for Logan brick at $1.72 per square yard.

Houston, Tex.—W. E. Humphreville has contract for cement walks at 15 cents per foot and for curbing walls and iron railings at $1.30 per linear foot.

Jacksonville, Ill.—A. F. Frank has contract for paving four streets with brick.

Jenkintown, Pa.—John McMenamy, Philadelphia, has contract for paving at $27,350 for Telford on two roads.

Kalamazoo, Mich.—Lake Erie Asphalt Block Company has contract for paving Park Place at $2.25 per square yard.

Kansas City, Mo.—Barber Asphalt Paving Company has a contract for paving amounting to $32,991.

Knoxville, Tenn.—R. L. Peters has contract for $50,000 worth of pike work in Hamblem County.

Milwaukee, Wis.—E. Schultz has contract for 8,000 feet of walks at 79 cents per linear foot.

Morristown, Tenn.—R. L. Peters has contracts for wagon roads at $50,000.

Newark, N. J.—It is stated that David E. Olds has contract for resurfacing Fourth street bridge with wood block at $3 per square yard, with 5-year guarantee, and $3.12½ for 10-year guarantee.

Norfolk, Va.—J. T. Bolton has contract for extending City Hall avenue at $17,200.

Omaha, Neb.—Daniel Harmon has contracts for paving aggregating $71,167.

Ottawa, Kan.—N. E. Stucker has contract for brick paving.

Peoria, Ill.—A. D. Thompson was low bidder for paving on New York avenue.

St. Paul, Minn.—Fielding & Shepley have contract for paving at $3,560.

San Jose, Cal.—James Casley received contract for walks on three streets.

Southampton, N. Y.—H. J. Miller has contract for curbing and macadam paving at $33,099.

South Omaha, Neb.—Dan Hannon received contract for grading, curbing and paving South 24th street at $71,167.

Spokane, Wash.—Contract awarded Washington Water Power Company for widening Division street at $5,000.

Tacoma, Wash.—F. A. Keasce has contract for paving Pacific avenue.

Titusville, Pa.—Fred Robinson has contract for road to Hydetown at $11,000.

Upper Sandusky, O.—Gaudert Bros. have contract for paving at $49,622.

Washington, Ia.—William Harriban has contract for Purington brick at $1.37½ per square yard.

WATER SUPPLY

Asbury Park, N. J.—May have 20,000,000 gallon reservoir. J. L. Coffin, Superintendent Department of Water and Sewers.

Bellaire, O.—Ordinance will provide for $20,000 bond issue for water works improvements.

Bessemer, Ala.—Bessemer Water Works will lay 14 inch main.

Binghamton, N. Y.—Bids April 4 for 12 million gallon pumping engine, previously noted on this sheet. John Anderson, Superintendent Water Works.

Bordentown, N. Y.—Have voted $5,000 for water works.

Brockton, Mass.—Will lay about two miles of 24 in. and 1½ miles 20 in. pipe, also erect 30-ft. standpipe. C. R. Felton, Cy. Engr.

Brooklyn, N. Y.—Flatbush Water Co. will have an $8,000 pumping station.

Buffalo, N. Y.—Will probably purchase two new pumps for water works.

Castile, N. Y.—Reported that $32,000 water bonds have been issued.

Chicago, Ill.—May make improvements to cost $2,290,000, which will include new pumps, mains, etc.

Chicago, Ill.—$200,000 in 1904 budget for water meters.

Clearwater, Minn.—May have water works.

Cleveland, O.—Ordinances provide for $9,000 for iron pipe and fittings, $9,000 for hydrant, $5,000 for pig lead.

Columbus, O.—Will vote on $1,500,000 bonds for purifying and softening water.

Corunna, Mich. Bd. Pub. Wks. reports in favor of a standpipe system.

Dallas, Tex.—Estimated cost of extending mains is $160,000.

Duluth, Minn.—May make improvements to system for W. Duluth. Bd. Water & Light Comrs.

E. Toronto, Ont.—Plans preparing for water works to cost about $35,000. J. McPherson, Cham. Com.

Edwards, Miss.—May issue $10,000 for water works.

Elberton, Ga.—Voted $40,000 bonds for water works. The Mayor.

Enid, Ok. Ter.—Will vote April 4 on $75,000 water works bonds for extension.

Gainesville, Ga.—May install electric pump.

Gloucester, Mass.—Water board wants $150,000 bond issue for construction work and extension of mains.

Gobleville, Mich.—Considering $20,000 bond issue for water works and light plant.

Gouverneur, N. Y.—Will vote on issue of $4,500 bond for new water main.

Grand Rapids, Mich.—Will consider water works extensions.

Harrisburg, Pa.—New water mains authorized. Mayor McCormick.

Harrisburg, Pa.—Plans almost complete for filtration plant for which bids were to be asked.

High Springs, Fla.—Considering bond issue for water works and light plant.

Jefferson, Tex.—Voted to issue bonds for water works.

Jersey City, N. J.—Will probably spend $140,000 for water pipe.

Joplin, Mo.—Considering municipal water works.

Kansas City, Mo.—Will lay 30 inch water mains in several streets at cost of $22,306.

Kensington, Md.—May issue bonds for water works and light plant.

Laramie, Wyo.—Considering water works.

Laurel, Miss.—Will issue $20,000 bonds for water works. The Mayor.

Lebanon, Pa.—Will construct pipe line. T. R. Crowell, City Engr.

Logan, Utah.—May issue $25,000 additional water bonds.

Lynchburg, Va.—Bids about April 1 for gravity water system.

Manchester, Mass.—Will probably spend $2,000 for water meters; $1,500 improvements recommended. Water Commissioners.

Mansfield, O.—$15,000 reservoir proposed; also $25,000 meter system.

Marquette, Mich.—Plans prepared for improvements to water works.

(Continued on page 28.)

THE BEST MUNICIPAL BOOKS

Miscellaneous.

MUNICIPAL IMPROVEMENTS. Manual of the methods, utility and cost of public improvements. W. F. Goodhue. 207 pp., illus. $1.75. w.

ECONOMIC DISPOSAL OF TOWNS' REFUSE. W. F. Goodrich. (English.) 340 pp., illus. $3.50. Pstg. 16c. w.

AMERICAN MUNICIPAL PROGRESS. Chapters in municipal sociology. Charles Zueblin. 380 pp. $1.25 net. mc.

THE IMPROVEMENT OF TOWNS AND CITIES. Practical basis of civic æsthetics. Charles Mulford Robinson. 309 pp. $1.25 net. Postage 9c. p.

THEORY AND PRACTICE OF TAXATION. David A. Wells, LL.D. 650 pp. $2.00. Postage 14c. a.

MUNICIPAL MONOPOLIES. A collection of papers by American economists and specialists. Edward W. Bemis, Ph.D. 680 pp. $2.00. Postage 14c. tc.

MUNICIPAL PUBLIC WORKS. Their inception, construction and management. S. Whinery, C.E. 341 pp. $1.50. Postage 13c. mc.

STEAM POWER PLANTS: THEIR DESIGN AND CONSTRUCTION. Henry C. Meyer, Jr. 159 pp., illus. $2.00. Postage 12c. m.

SURVEYING. A general hand-book for field and office. John Whitelaw, Jr. (English.) 506 pp., illus. $4.00 net. Postage 21c. v.

MUNICIPAL GOVERNMENT IN CONTINENTAL EUROPE. Albert Shaw. 491 pp. $2.00. Postage 18c. c.

MUNICIPAL GOVERNMENT IN GREAT BRITAIN. Albert Shaw. 375 pp. $2.00. Postage 15c. c.

PORTLAND CEMENT. Its manufacture and use. Charles D. Jameson. $1.50. v.

FACTS ON FIRE PREVENTION. The result of tests by British Fire Prevention Committee. Edwin O. Sachs. (English.) 2 vols., 226 pp. each. Illus. $10. Postage 20c. per vol. sr.

DISINFECTION AND DISINFECTANTS. A practical guide for sanitarians, health and quarantine officers in stamping out infection. M. J. Rosenau, M.D. 345 pp., illus. $2.00 net. Postage 15c. b.

HAND BOOK ON SANITATION. Manual on theoretical and practical sanitation. George M. Price. (English.) 306 pp., illus. $1.50 net. Postage 10c. w.

PRACTICAL TREATISE ON THE EXAMINATION OF MILK, CREAM, BUTTER, ETC. J. A. Wanklyn. $1.00. v.

STREET CLEANING AND THE DISPOSAL OF A CITY'S WASTES. Geo. E. Waring, Jr. 230 pp. $1.25.

AMERICAN COMMONWEALTH. James Bryce. The relation of the city to the State. 3d edition. 2 vols. $4. Postage 40c. Abridged edition, $1.75. Postage 18c. mc.

THE CITY FOR THE PEOPLE. Prof. Frank Parsons. An exhaustive work on municipal problems. 700 pp. $1. Postage 20c. cft.

MUNICIPAL HOME RULE. F. J. Goodnow. Shows difference between city as agent of the State and as acting for local needs. 283 pp. $1.50. Postage 15c. mc.

Lighting

ELECTRIC LIGHTING. Treatise on installation and operation of electric plants. F. B. Crocker. 2 vols., illus. $3.00 each. Postage 23c. per vol. v.

FINANCES OF GAS AND ELECTRICITY MANUFACTURING ENTERPRISES. How to run plants successfully. William D. Marks. 120 pp. $1.00. Postage 5c.

ELECTRIC LIGHT PLANTS. Their cost and operation. Buckley. $1. ftw.

ART OF ILLUMINATION. How to properly distribute artificial light. Louis Bell, Ph.D. 350 pp., illus. $2.50. Postage 20c. m.

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See other lists elsewhere.

Marshfield, Wis.—Council paid $150,000 for water works and electric light plant.

Masillon, O.—Will soon consider estimates for water plant.

Mechanicsburg, O.—Municipal ownership of water works for fire protection is advocated by authorities.

Miamisburg, O.—Will issue $80,000 water bonds.

Millbank, S. D.—Plans prepared for $25,000 water works.

Montreal, Quebec.—Will probably purchase 12 million gallon pump to cost about $75,000.

Monrovia, Cal.—Considering improvements to water works.

Moorhead, Minn.—Voted to issue $16,000 bonds to improve water works.

Napoleon, O.—Reported to have voted $24,000 bonds to extend water works.

Newton, Ia.—Will extend the water mains.

New Orleans, La.—J. F. Coleman, Engr. Bd. Port Comrs., recommends water works on river front probably to cost $50,000.

New York, N. Y.—Plans preparing for salt water main system for this city and Brooklyn.

Nezperce, Ida.—May have water works.

No. Andover, Mass.—It is proposed to extend water system at cost of $5,000. Jas. W. Leitch, Town Clerk.

No. Attleboro, Mass.—May extend water system at cost of $30,000.

Pawtucket, R. I.—May make $25,000 improvements to water works.

Red Lion, Pa.—Voted $30,000 bonds for reservoir and water works.

Rio, Wis.—Were to vote on bond issue for water works, probably cost $11,000.

Rochester, N. Y.—$30,000 asked in tax levy for improving Holly system. Will issue $170,000 bonds for Hemlock lake watershed.

Rockville, Md.—May issue $5,000 bonds for improving water works and light plant.

Salt Lake City, Utah.—City Clerk L. C. Kelsey writes that bids will be asked about April 6 for 15,800 lin. ft. 6-8-10 in. water mains.

Santiago, Chile.—Bids July 1 for water supply sewerage and pavement. Chilean Consul General, 135 W. 11th St., N. Y.

Smithland, Ia.—Will vote on bond issue for water works.

Statesboro, Ga.—Bids April 12 for water works and electric light systems. C. S. Johnson, Mayor.

Toledo, O.—Bids April 4 for laying 20-in. c. i. water pipe. Thos. R. Cook, Supt. W. Wks. Bd. Pub. Sec.

Trenton, N. J.—May put in 30-in. to replace present 16-in. main; would cost about $100,000.

Wapakoneta, O.—Will issue $7,000 bonds to enlarge water and light plant.

Washington, N. J.—Will vote on $100,000 bond issue for water works.

Watanga, Va.—Have issued $125,000 water bonds.

Watertown, N. Y.—Will issue $100,000 bonds for pure water supply.

Waxahachie, Tex.—Contemplate $24,000 bond issue for improving water system.

Wheeling, W. Va.—Will probably install water meters extensively. J. R. Butts, Pres. W. Bd.

Whitman, Mass.—May spend $15,092 in water supply improvement.

Wilson, N. C.—Will spend $40,000 to extend water mains and renew system.

CONTRACTS AWARDED

Ashfield, Mass.—L. A. Weston has contract for water works system at $15,000.

Atlantic City, N. J.—Van Sant & Boehm have contract for 12-in. submerged main, at $1,425.

Baltimore, Md.—Tipett & Wood have contract for steel standpipe at $6,828.

Boston, Mass.—U. S. Cast Iron Pipe & Fdy. Co. has contract for 2,400 tons pipe, 50 tons spec. castings at $54,905.

Cambridge, O.—Wm. S. Cocran, Pittsburg, Pa., has contract for extension to water works at $13,047.

(Continued on page 29.)

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Sewers and Sewage

SEWAGE AND BACTERIAL PURIFICATION OF SEWAGE. Methods of disposal, etc. Samuel Rideal, D.Sc. (English.) 278 pp. $3.50. Postage 13c. w.

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SEWAGE DISPOSAL. Methods of disposal and purification. Wyncoop Kiersted. 182 pp. $1.25. w.

SEWER DESIGN. Treatise on sewer construction. H. N. Ogden. 234 pp., illus. $2.00. w.

SEWERS AND DRAINS FOR POPULOUS DISTRICTS. Rules and formulas for dimensions and construction. J. W. Adams. $2.50. v.

PURIFICATION OF SEWAGE. Scientific principles of sewage purification and their application. Sidney Barwise. (English.) Illus. $2.00. v.

BACTERIAL PURIFICATION OF SEWAGE. Modern biological methods of purification. Sidney Barwise. (English.) Illus. $2.50 net. Postage 11c. v.

CLEANING AND SEWERAGE OF CITIES. Translated from the German. R. Baumeister. Illus. $2.00. v.

SEWAGE WORKS ANALYSES. Methods of analysis used in laboratory of Manchester Sewage Works, England. Gilbert J. Fowler. 128 pp., illus. $2.00 net. Postage 6c. w.

PURIFICATION OF SEWAGE AND WATER. W. J. Dibdin. (English.) 2d Edition. Illus. 379 pp. $6.50. Postage 18c. v.

SEWAGE DISPOSAL IN THE UNITED STATES. G. W. Rafter and M. N. Baker. Illus. $6.00. v.

SEPARATE SYSTEM OF SEWERAGE. Theory and construction. Cady Staley and G. S. Pierson. Illus. $3.00. v.

SEWERAGE AND LAND DRAINAGE. Geo. E. Waring, Jr. Illus. $6.00. v.

MODERN METHODS OF SEWAGE DISPOSAL FOR TOWNS, PUBLIC INSTITUTIONS AND HOUSES. Geo. E. Waring, Jr. Illus., 260 pp. $2.00. v.

SEWERAGE AND SEWAGE PURIFICATION. M. N. Baker. 50 cents. v.

THE TREATMENT OF SEWAGE. Dr. C. Meynott Tidy. 50 cents. v.

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HIGHWAY CONSTRUCTION. Treatise on construction and maintenance of roads, streets and pavements. A. T. Byrne. 895 pp., illus. $5.00. w.

TEXT-BOOK ON ROADS AND PAVEMENTS. Country roads and city streets. F. P. Spalding. 213 pp., illus. $2.00. w.

STREET PAVEMENTS AND PAVING MATERIALS. Methods and materials of city street construction. George W. Tillson. 496 pp., illus. $4.00. Postage 19c. w.

ROADS AND PAVEMENTS. Paving materials and pavement construction. Ira Osborn Baker. 600 pp. Illus. $5.00. Postage 21c. w.

CITY ROADS AND PAVEMENTS. William Pierson Judson. 186 pp., illus. $2.00. Postage 12c. e.

ROADS: THEIR CONSTRUCTION AND MAINTENANCE. Special reference to road materials. Allen Greenwell and J. V. Elsden. (English.) 280 pp., illus. $1.50. Postage 9c. wh.

ECONOMICS OF ROAD CONSTRUCTION. A short practical treatise. Herbert P. Gillette. 41 pp., illus. $1.00. e.

PRACTICAL TREATISE ON THE CONSTRUCTION OF ROADS, STREETS AND PAVEMENTS. Gen. Q. A. Gilmore. Illus. $2.00. v.

NEW ROADS AND ROAD LAWS IN THE UNITED STATES. Gen. Roy Stone. Illus. $1.00. v.

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Cody, Wyo.—S. D. Lowell has contract for water works at $12,290.

Durham, Ind. Ter.—Means & Fulton, Birmingham, Ala., have contract for standpipe at $10,740.

Durant, Ind. Ter.—H. C. Ullen, Jr., has contract for construction of water works at $77,777.

E. Orange, N. J.—Snow Steam Pump Wks. have contract for pumps at $48,050.

E. Orange, N. J.—Commonwealth Roofing Co., of Newark, was low bidder for new reservoir, at $49,525.

E. Orange, N. J.—Warren Fdy. & Machine Co., N. Y., has contract for 3,184 tons c. i. pipe at $74,331; Rensselaer Mfg. Co., Troy, N. Y., for valves, etc., at $1,856; D. Cuozzo & Bros., N. Y., for laying 26,600 ft 24-in. pipe, etc., at $28,334.

Erie, Pa.—National Transit Co. has contract for 3,500,000 gallon pumping engine at $27,500.

Jefferson Barracks, Mo.—H. E. Horton, Chicago, has contract for 150,000 gallon steel tank, at $12,900.

Leadville, Colo.—Fleeler, Saxon & Co. have contract for two reservoirs.

Meriden, Conn.—Warren, Fdy. & Machine, of N. Y., has contract for 425 tons of c. i. pipe 6 to 12 in. for $10,679.

Minneapolis, Minn.—Jas. B. Clow & Son have contract for 19 4-in. gate valves at $12.60 each and 1-8 in. at $19.50; Northwestern Fdy. for 200 frost jackets at $7.50 each.

New Bedford, Mass.—Warren Fdy. & Machine Co., of N. Y., has contract for 223 tons of 12, 6 and 4-in. c. i. pipe and 4½ tons specials, at $5,465.

Ottawa, O.—W. J. Graham received contract for station stack and reservoir for new water works; other contract will be let later.

Oxford, N. C.—Mr. Elbert, of Watertown, Conn., has contract for water works and light plant.

Seattle, Wash.—American Bridge Co., of N. Y., has contract for 1,000,000 gallon standpipe, at $19,397.

Terre Haute, Ind.—Allis-Chalmers Co. has contract for pumping engine for T. H. Water Wks. Co.

The Dalles, Ore.—Robt. Wakefield has contract for water pipe line at about $50,000.

Wanbay, S. D.—Des Moines Bridge & Iron Wks., Des Moines, Ia., has contract for water works at $6,880.

LIGHTING

Absecon, N. J.—W. F. McCully has franchise for gas plant.

Anadarko, Okla. Ter.—Voted $50,000 bonds for electric light plant and sewer system.

Andalusia, Ala.—Frank Sutter has franchise for light plant.

Attica, O.—Have issued $6,250 electric light bonds.

Ballard, Wash. C. E. Remsberg, has asked franchise for electric light plant.

Baltimore, Md.—May have municipal light plant.

Baton Rouge, La.—Will have electric light plant.

Beaver, U.—Voted $10,000 bonds for electric light plant.

Browning, Mo.—May have electric light plant.

Buena Vista, Ga.—Contemplate letting franchise for electric light plant.

Burlington, N. J.—Considering purchase of electric light plant.

Carthage, Tenn.—May have electric light plant.

Cicero, Ill.—Plans preparing for electric light plant.

Clayton, Ga.—Will build electric light plant. J. A. Reynolds.

Clinton, Miss.—Voted to issue bonds for light plant and water works.

Columbia, Tenn.—Considering electric light plant.

Dayton, Tenn.—May grant electric light franchise.

Delaware City, Ind.—Light plant proposed.

Drayton, N. D.—May have electric light plant.

East Lanke, Ala.—Were to vote March 28 on bond issue for $10,000 electric light plant. City Clerk M. M. Barrett.

East Milwaukee, Wis.—Milwaukee Light, Heat & Traction Company wants franchise for lighting village.

Ellensburg, Wash.—Have issued $16,000 bonds for light plant. George Sayles, City Clerk.

(Continued on page 30.)

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Water Supply.

WATER-SUPPLY. Considered from a sanitary standpoint. Wm. P. Mason. 500 pp., illus. $4.00. Postage 18c. w.

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PUBLIC WATER-SUPPLIES. Requirements, resources and construction of works. F. E. Turneaure and H. L. Russell; with a chapter on pumping machinery by D. W. Mead. 733 pp., illus. $5.00. Postage 24c. w.

MICROSCOPY OF DRINKING WATER. Methods of examination of and organisms found in water. George C. Whipple. 338 pp., illus. $3.50. w.

WATER-SUPPLY ENGINEERING. Design, construction and maintenance of water-supply systems, both city and irrigation. A. Prescott Folwell. 562 pp., illus. $4.00. w.

WATER POWER. Outline of the development and application of the energy of flowing water. Joseph P. Frizell. 589 pp., illus. $5.00. w.

WATER FILTRATION WORKS. Purification of water by slow and rapid filtration and the design of works. James H. Fuertes. 283 pp., illus. $2.50. Postage 10c. w.

FILTRATION OF PUBLIC WATER-SUPPLY. Construction and operation of rapid and slow filters and treatment of waters. Allen Hazen. 321 pp., illus. $3.00. w.

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PURIFICATION OF PUBLIC WATER SUPPLIES. John W. Hill. 304 pp., illus. $3.00. v.

REPORT ON THE FILTRATION OF RIVER WATERS FOR THE SUPPLY OF CITIES IN EUROPE. James P. Kirkwood. Illus. $7.50. v.

WATER-WORKS DISTRIBUTION. A guide to the laying out of distribution mains for cities and towns. J. A. McPherson. Illus. $2.50. v.

WATER ANALYSIS. Treatise on the examination of potable water. J. A. Wanklyn. $5.00. v.

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WATER WORKS FOR SMALL CITIES AND TOWNS. John Goodell. 281 pp, illus. $2.00. m.

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See other lists elsewhere.

Fort Gaines, Ga.—May have electric light and power plant.

Fremont, Neb.—Municipal light plant will soon be enlarged at cost of $8,000.

Geneseo, N. Y.—Reported that Geneseo Gas & Electric Company will build new gas plant. A. Wyness, Jr., Superintendent.

Georgetown, Ky.—Georgetown Water, Gas, Electric Light & Power Company will build gas plant.

Gilroy, Cal.—Council considering electric light system.

Gladstone, Mich.—Local parties have franchise for electric light plant.

Gobleville, Mich.—Considering $20,000 bond issue for light plant and water works.

Harrison, N. J.—Reported that United Electric Company has franchise to lay underground conduits.

High Springs, Fla.—Considering bond issue for electric light plant and water works.

Jacksonville, Fla.—May issue bonds for improving electric light plant.

Jefferson, Ga.—May have electric light plant.

Kensington, Md.—May issue bond for light plant and water works.

Kewannee, Wis.—Will vote on municipal light plant this spring.

Landsdale, Pa.—Montgomery Heat & Fuel Company has franchise for gas plant here.

Lexington, Neb.—Bids were asked for franchise for electric light plant.

Libby, Mont.—Bids probably in July for electric light plant, estimated cost $6,000.

Lockport, N. Y.—Will vote on $50,000 municipal light plant.

Lyons, Ga.—Considering feasibility of electric light plant.

Marshfield, Wis.—City will purchase M. Water, Electric Light & Power Company's plant for $150,000, according to agreement with city council.

Merrimac, Mass.—Voted to build electric light plant. Town Clerk.

Montreal, Que.—Conduit system would cost about $125,000.

Morrison, Ill.—National Gas & Water Company is making arrangements for gas heating and lighting plant for this place.

Mt. Union, Pa.—Voted to issue $12,000 bonds for electric light plant.

Napoleonville, La.—Will install acetylene lighting system in courthouse and jail.

Negaunee, Mich.—Rockwell Bros. will construct new gas and electric plant here.

Neenah, Wis.—Wisconsin Traction, Light, Heat & Power Company has 10-year franchise for lighting city.

New Castle, Pa.—Plans preparing for $65,000 municipal electric light plant.

Newhaven, Ind.—Bids April 5 for electric light plant. Board of Town Trustees.

Newport, Ky.—May purchase or build electric light plant.

North Vernon, Ind.—Preparing to improve and enlarge light plant.

Penfield, N. Y.—Considering electric light system.

Piedmont, Ala.—Considering acetylene lights.

Richland Center, Wis.—Reported the city will have $20,000 electric plant.

Rockville, Md.—May issue $5,000 bonds for improving light plant and water works.

San Antonio, Tex.—City Clerk George F. Stuemke writes that bids are wanted April 6 for two years lighting of city with gas or electricity. J. P. Campbell, Mayor.

Santa Cruz, Cal.—May have light plant for 3,000 lights.

Sapulpa, Ind. Ter.—Reported that this place will have $27,500 electric plant.

Savannah, Ga.—Savannah Gas Company will issue $1,750,000 bond, one-half for improvements.

Sebastopol, Cal.—G. W. Swain has asked franchise for light and power plant.

Sedalia, Mo.—Will consider plans for electric light plant.

Shreveport, La.—F. R. Hodges has asked franchise for electric light and gas plant.

Springfield, Mass.—Springfield Gas Light Company will build plant to manufacture coal gas. F. DeV. Thompson, manager.

(Continued on page 31.)

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Statesboro, Ga.—Bids April 12 for electric light and water works systems. C. S. Johnston, Mayor.

Toronto, Ont.—Consumers Gas Company may build $500,000 gas holder.

Uniontown, Ky.—Reported that G. F. Cecil has purchased electric light plant and will improve.

Wapakoneta, O.—Will issue $7,000 bonds to enlarge light and water plants.

Washington, Ind.—Washington Gas Company will build $60,000 gas plant.

Weehawken, N. J.—Considering municipal light plant.

West Mansfield, O.—Have issued $11,000 electric light bond. C. D. Atkinson, Clerk.

Wheeling, W. Va.—Plans preparing for oil water gas plant to cost $40,000.

Williamsport, Pa.—May ask for bids soon for lighting plant.

CONTRACTS OF WATER

Alleghany, Pa.—Gen. Elec. Co., Schenectady, N. Y., have contract for two dynamos and 300 enclosed arc lights at $9,400.

Beloit, Wis.—W. H. Wheeler was lowest bidder for electric light plant at $47,500. A. M. Searles, Chicago, bid $34,000 without building.

Boston, Mass.—Lord Elec. Co. was low bidder for grammar school at $4,578.

Indianapolis, Ind.—Ind. Light & Power Co. have contract for lighting for ten years at $75 per year for enclosed arcs, $74 for open arcs and $35 for incandescents.

Oxford, N. C.—Mr. Ebert, of Watertown, Conn., has contract for light plant and water works.

Palmyra, Mo.—C. W. Brunson has contract for electric light plant at $8,493.

Sandersville, Ga.—McKenzie & Son have contract for electric light and water plant at $39,000.

Sparta, Wis.—Council Com. recommended gas plant.

PUBLIC BUILDINGS

Akron, O.—Have issued $40,000 school improvement bonds.

Amarillo, Tex.—Potter County will vote on $50,000 bond issue for court house.

Belair, Md.—$25,000 worth of improvements are to be made on the courthouse.

Bernardville, N. J.—Considering the erection of a $32,000 school.

Birmingham, Ala.—Will vote April 4 on $100,000 bonds issue for schools.

Bloomfield, Neb.—Will isuue $15,000 school bonds.

Cambridge, Mass.—A $70,000 school proposed for Ward 7. Thomas Tracy, Superintendent of Buildings.

Carthage, Mo.—Plans prepared for a $100,000 school.

Chattanooga, Tenn.—Three new schools are contemplated.

Chicago, Ill.—Board of Education plans to provide fourteen new schools at a cost of $1,410,000. Addition to the high school will cost $155,000.

Claverack, N. Y.—Plans accepted for a new school.

Coffeyville, Kan.—Voted to issue $20,000 bonds for city hall.

Dallas, Tex.—Will issue $30,000 bonds for a school.

Glens Falls, N. Y.—$100,000 school bonds have been issued.

Houston, Tex.—Will have a $25,000 school.

Kalamazoo, Mich.—Considering the erection of a new city hall.

Latonia, Ky.—Plans accepted for a $25,000 school. Board of Education.

Leadville, Colo.—Bids April 19 for post office. J. K. Taylor, Super. Archt., Treasury Department, Washington, D. C.

Livingston, Mont.—Plans accepted for a $25,000 school.

Madison, Wis.—State capitol burned. Will erect new building at cost of $1,000,000.

Manchester, N. H.—$40,000 courthouse proposed for this place.

Malius, N. Y.—Plans prepared for a $25,000 school.

New Orleans, La.—Talking of a $40,000 school.

Opelika, Ala.—Will erect a city hall.

Perryville, Mo.—Have issued $30,000 courthouse bonds.

(Continued on page 33.)

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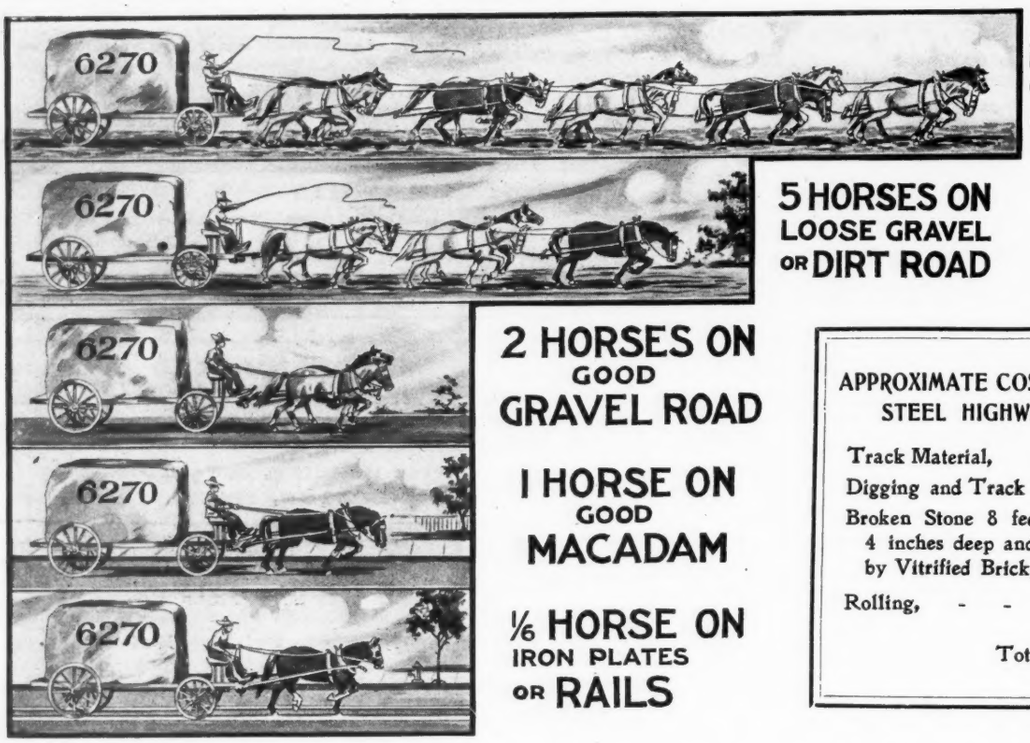

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Broken Stone 8 feet wide, 4 inches deep and bound by Vitrified Brick, - -	1,275
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Total, -	$5,700

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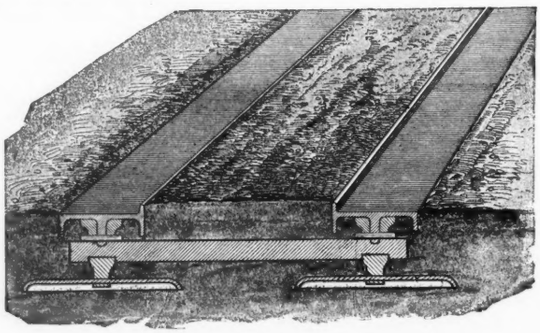

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Pontiac, Mich.—Plans accepted for courthouse to cost $100,000.

Rockford, Ill.—Plans prepared for $70,000 city hall. City Clerk H. C. Scoville.

Sacramento, Cal.—May have a $150,000 high school.

St. Louis, Mo.—Plans ready for two schools to cost $30,000 and $40,000, respectively. Commissioner of School Buildings Ittner.

St. Paul, Minn.—Plans ready for additions to two schools to cost $56,000.

Savannah, Ga.—Desire a $25,000 school to replace Barnard street school.

South Bend, Ind.—Plans prepared for a $30,000 school.

Stanbaugh, Mich.—Plans ready for a $17,500 school.

Sullivan, Ill.—Voted to erect a $70,000 courthouse.

Tekamah, Neb.—Mayor A. A. Anderson is in favor of a new courthouse.

Tupelo, Miss.—Will issue $50,000 courthouse bonds.

CONTRACTS AWARDED

Altamont, Ill.—Ogden & Boggs have contract for a school at $15,990.

Ansonia, Conn.—Beardsley Building Company, of Shelton, received contract for city hall at $28,692.

Antigo, Wis.—C. F. Dallman has contract for a library.

Boston, Mass.—P. H. Jackson was low bidder for a school at $112,348.

Cedar Rapids, Ia.—Bartlett & Kling, of Gallsburg, have contract for Carnegie Library at $61,225.

Crucksville, O.—Adams Bros. received contract for a school at $10,000, and the Shower Building Company for one at $17,000.

Fernandina, Fla.—W. T. Hadlow & Co. have contract for city hall at $8,000.

Great Falls, Mont.—Duncan Bros. received contract for school at $22,541.

Macon, Mo.—J. A. Carter has contract for school at $36,000.

Muskogee, Ind. Ter.—Charles S. Davis of Senaca, has contract for school at $24,000.

Talladega, Ala.—J. C. Hollingsworth & Co. have contract for $8,000 school.

Washington, D. C.—Isadore Parvarini received contract for a school at $166,800.

SEWERS

Anadarko, Okla Ter.—Voted $50,000 bonds for sewer system and light plant.

Athens, Ala.—Will soon have complete sewer system.

Aurora, Ill.—Sewers in District No. 6 will cost $13,600. Bd. Local Improvements.

Belleville, Ill.—Ordinance provides for 3¾ miles of outlet sewer. Louis Graner, City Engineer.

Binghamton, N. Y.—Colfax Avenue is to be sewered for 1,000 ft.

Birmingham, Ala.—Bids April 7 for 25,000 ft. 4 ft. sewer. Julian Kendrick, Ch. Engr. Jefferson C. Sanitary Comm.

Detroit, Mich.—Considering sewer extensions to cost $125,000. Comr. Maybury.

Duluth.—Two storm sewers will cost $13,310.

Fulton, N. Y.—Will survey for sewer system on West Side. City Engineer Burdick.

Galveston, Tex.—About 5,300 ft. for sewer will be built at cost of about $25,000. C. G. Wells, City Engineer.

La Crosse, Wis.—Ordinance provides for twenty-four blocks for sewers.

Muskegon, Mich.—Estimated cost of E. End sewer is $52,856.

Nashville, Tenn.—Plans preparing for sewers in several streets.

Meenah, Wis.—Bd. Pub. Wks. recommended 6,000 ft. of sewer to be built this season.

Newport, Ky.—Surveys made for $16,000 trunk sewer in 12th St.

Oskaloosa, Ia.—Plans prepared for $220,000 sewer system.

Ozark, Ala.—Will construct sewer system. M. McDonald, Engr.

Portage, Wis.—Will vote this month on sewerage system.

Racine, Wis.—Resolution provides for sewer in English Street.

Rochester, N. Y.—Will issue $100,000 bonds for East Side trunk sewer. Mayor Cutler. Considering Front Street tunnel sewer.

Rockford, Ill.—Petitions call for $14,000 worth of laterals. Bd. Local Improv't.

St. Louis, Mo.—Two new sewer districts will be found to cost $79,000.

St. Paul, Minn.—Sewer system in 8th ward would cost $54,000.

Salt Lake City, Utah.—City Clerk L. C. Kelsey writes that bids will be asked about April 6 for 16,600 lin. ft. 8-10-12 in. sewer pipe.

Santiago, Chile.—Bids July 1 for sewerage, water system, and pavements for this city, Chilean Consular General, 135 W. 11th Street, N. Y.

Schenectady, N. Y.—Considering sewer systems for ninth and tenth wards.

Sebring, O.—Plans preparing for sewer system.

Slippery Rock, Pa.—Voted to build sewer system and water works.

Springfield, O.—Considering sewerage system.

Stamford, Conn.—May ask bids for sewers.

Syracuse, N. Y.—Estimated cost of sewers in So. End is $9,000.

Topeka, Kan.—Estimated cost of sewer for sixth ward is $93,346. Jas. McCabe, City Engineer.

Uniontown, Ala.—Contemplate sewer system. L. A. Morgan, Mayor.

Waukegon, Ill.—West Side sewer system will cost $60,000.

West Chester, Pa.—Considering sewers.

Wilson, N. C.—Will spend $40,000 to extend sewer system and water mains.

Winnipeg, Man.—Want bids for sewer in Florence Avenue.

Woonsocket, R. I.—Considering one-half mile of sewers. F. H. Mills, City Engineer.

Youngstown, O.—Sewers will be constructed in several streets.

CONTRACTS AWARDED

Atlantic, Ia.—W. A. Edgar, Cedar Rapids, Ia., has contract for sewer system.

Augusta, Ga.—Hallihan & Costello have contract for pipe sewers at $6,700.

Belleville, Ill.—Brauch & Co. have renewed contract at $2,128.

Berwick, Pa.—Hind, Sherman & Co., of Syracuse, N. Y., have contract for sewer system, at $70,000.

Brooklyn, N. Y.—Geo. W. Phillips was low bidder for sewers in two streets, etc., at $13,364.

Buffalo, N. Y.—Snow Stream Pump Wks., of N. Y., will probably get contract for sewage pumping stations at $35,100.

Casper, Wyo.—O'Brian & Rhoades were low bidders for sewers at $11,137.

Cedartown, Ga.—J. L. McPoland & Co., Birmingham, Ala., have contract for one mile of sewers.

E. Syracuse, N. Y.—Auburn Stone Co has contract for sewer at $22,686.

Fulton, Mo.—M. T. Huntington, Kansas City, has contract for sewer system at $21,810.

Kansas City, Mo.—W. M. Boyd Construction Co., have contract for 48 inch steel flowline at $170,000.

Ligonier, Ind.—H. Spurgeon has contract for sewer at $2,400.

Long Beach, Cal.—E. L. Plantico was low bidder for 27,000 feet lateral sewers at 78½ cents per foot.

Omaha, Neb.—J. O. Corby received contract for Saddle Creek sewer at $23,629.

Pine Bluff, Ark.—Robinson Bros. have contract for sewer at $3,800.

Red Oak, Ia.—Shepard & Hamahan, Des Moines, have contract for two miles sewers at about $6,300.

Saginaw, Mich.—Morley, Emen & Co. have contract for hydraulic cement at 72 cents per barrel; Goodman & Winlke have contract for sewer pipe and drain tile; Masillon Iron & Steel Co. has contract for water pipe castings; S. Fair & Son for sewer and castings.

Saginaw, Mich.—S. Fair & Son were low bidders for sewer castings for 1904 at $1.65 per 100 pounds.

St. Paul, Minn.—P. H. Thornten has contract for sewer at $3,597; Chas. Johnson has contract for sewers in two streets at $1,665.34.

(Continued on page 34.)

Scranton, Pa.—Egh & Co. have contract for sewer in 17th sewer dist. at about $53,000.

Seattle, Wash.—J. F. Riley & Co., have contract for sewer in 27th Ave.

Vailsburg, N. Y.—Headley & Christie of Newark, have contract for sewer system at $53,453.

FIRE APPARATUS

Anthon, Ia.—A volunteer fire department has been formed.

Antwerp, N. Y.—A fire department has been organized here.

Attleboro, Mass.—The fire department asked an appropriation for 1,000 feet of hose.

Bakersfield, Cal.—A vote is to be taken on April 12 on $10,000 bonds for improving the fire department.

Baltimore, Md.—A new engine and truck are to be installed in place of those lost at the fire. Chief Horton desires to have over twenty engine companies installed.

Bellington, Wash.—Better fire protection has been under consideration.

Binghamton, N. Y.—A new hose company may be established.

Blunt, S. D.—A volunteer company has been organized with J. A. Howard, chief.

Brooklyn, N. Y.—A number of new engine houses are wanted by Deputy Chief Doyle; also improvement to the alarm system.

Byesville, O.—A fire department has been organized here with Harry Heed, chief.

Cambridge, Mass.—A resolution was adopted appropriating $25,000 for a fire station.

Camden, N. J.—Will probobly issue $40,000 for two fire stations.

Cameron, N. Y.—Volunteer fire department has been organized here. S. H. Stuart, chief.

Carlinsville, Ill.—May purchase a new engine and build a new fire station.

Chalfont, Pa.—Young America Volunteer Fire Company organized. A. H. Groff, chief.

Cincinnati, O.—Planning for six new engines, etc. Bd. Public Safety.

Clarkston, Mich.—Considering fire protection. The Mayor.

Cumberland, Md.—May issue $25,000 bonds for paid fire department.

Dallas, Tex.—New hydrants may be installed.

Danville, Ill.—Germantown village is to have a fire department and will buy a chemical engine according to reports. Fred Sadawasser.

Dubuque, Ia.—A new engine house will be erected in the 5th ward.

Dumont, N. J.—Dumont Valley Fire Co. No. 2 organized.

Edgewater, N. Y.—Rosebank Hose Co. organized and admitted to fire department.

Elm Park, N. Y.—Rocky Fire Company organized.

Glenville, O.—An ordinance provided for an $8,000 bond issue for fire engine and $2,000 for house equipment.

Granite City, Mo.—Volunteer company organized.

Howell, Ind.—Citizens want fire protection. Chief Dunlevy, Evansville.

Indianapolis, Ind.—American Fire Engine Co. has contract for new engine at $4,500.

Jacksonville, Ill.—City was to buy second-size fire engine and install police and fire alarm system.

Jasper, Ill.—Volunteer company formed.

Knoxville, Tenn.—Council ordered the following equipment for the fire department: A steamer, 5,000 feet of hose, a combination wagon, equipment for truck and several hydrants. Bd. Pub. Works.

Lake Charles, La.—Voted to issue $10,000 bonds for fire apparatus.

Lansing, Mich.—City needs a chemical engine and hose wagon.

Lehighton, Pa.—Lehigh Fire Co. No. 1 organized. A. J. Snyder, secretary.

Little Falls, N. Y.—Chief Cooney asked for 2,500 feet of hose and twelve fire hydrants.

Lockport, N. Y.—May issue $5,000 bonds for fire apparatus.

Long Beach, Cal.—A department is being organized to consist of two hose companies and truck company.

(Continued on page 35.)

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Longmont, Colo.—A paid department has been under consideration.

McKees Rocks, Pa.—A fire alarm system has been considered. Chief Engel.

Marisa, Ill.—Fire Co. No. 1 incorporated.

Montgomery, N. Y.—A fire alarm system is greatly needed according to reports. Chief D. E. Collins.

Montreal, Canada.—The fire alarm system is to be extended.

Nashville, Tenn.—The underwriters recommended that steamers, a combination wagon, and 1,600 feet of hose be obtained for a new company.

Northfield, Mass.—A hose wagon and necessary hose may be purchased.

Omaha, Neb.—Contract for a Metropolitan engine awarded the American Fire Engine Co., Seagrave Co., Columbus, O., has contract for hose wagons and truck.

Opelika, Ala.—A paid fire department will be installed.

Ottawa, Ont.—The chief recommended the purchase of two fire engines.

Parnassus, Pa.—Will install a fire alarm system.

Pawtucket, R. I.—May erect a $30,000 fire station.

Peoria, Ill.—$2,000 to be spent on fire apparatus.

Perth Amboy, N. J.—Will secure two fire engines. Mayor Seaman.

Piqua, O.—Have sold $35,000 bonds for fire station and equipment.

Port Dickinson, N. Y.—Warner Hose Co. incorporated.

Racine, Wis.—Will vote on $25,000 bond issue for central fire station.

Rockland, Mass.—A hose wagon was asked for by the fire engineers.

St. Clair City, Mich.—A fire department has been formed. D. P. Ingles.

St. Paul, Minn.—A new engine house with equipment recommended.

Salem, Mass.—Council favored the purchase of 1,000 feet of hose.

Salem. O.—Considering improvement to the fire department.

Sawtelle, Cal.—Fire protection has been under discussion. F. C. Langdon.

Schenectady, N. Y.—Two new engine houses will be erected.

Springfield, Mo.—Perry Buchanan has contract for fire station at $4,687.

Springwater, N. Y.—Volunteer fire company organized. W. W. Boies, secretary.

Syracuse, N. Y.—Bids are to be asked for 5,000 feet of hose.

Taunton, Mass.—Chief Leonard recommended a new aerial truck.

Terre Haute, Ind.—A fire house is to be erected in the East End.

Toledo, O.—New fire apparatus may be purchased according to reports.

Topeka, Kan.—Considering the purchase of a fire engine.

Trenton, N. J.—Fire & Water Commissioner recommended three engines, a new company and $100,000 for new water mains.

Twin Brooks, S. D.—It was stated that fire apparatus would be obtained.

Urbana, Ill.—It is said that fire hose and hydrants are needed.

Westfield, N. J.—Three fire companies organized.

Westhampton Beach, N. Y.—Fire Co. No. 1 formed. G. E. Winters, secretary

Wheatland, Cal.—A vote may be taken on $20,000 bond issue for fire protection.

Wheeling, W. Va.—New alarm boxes may be installed.

Wilkesbarre, Pa.—A resolution provided for a new engine and truck for fire department.

Worcester, Mass., Chief G. S. Coleman asked for a new water-tower.

York, Pa.—Frey & Thomas received contract for 600 feet of hose at 90 cents a foot.

MISCELLANEOUS

Albany, N. Y.—J. C. Wasserback has contract for removal of street dirt at 50 cts. per cu. yd.

(Concluded on page 36.)

Belleville, Ill.—Cost of septic tank and intercepting sewer placed at $76,000.

Belleville, Ill.—Mayor Fred. J. Kern wrote that his city wanted a modern sprinkling wagon, flusher preferred.

Butler, Mo.—Will have sewage disposal plant in connection with new system.

Champaign, Ill.—Garbage crematory proposed for city. Mayor Swingart.

Chattanooga, Tenn.—May purchase sites for park purposes.

Chicago, Ill.—May have garbage disposal plant.

Cohoes, N. Y.—John Quinlan has contract for street cleaning.

Columbus, O.—Ordinance provides for $46,000 appropriation for experimental sewage disposal plant.

Davenport, Ia.—May have $50,000 park.

Des Moines, Ia.—Citizens complaining about street cleaning.

Elizabeth, N. J.—Thos. Viscont has contract for scavenger work for three years at $35,000.

Erie, Pa.—Mayor Hardwick refused to sign resolution to improve Lakeside Park.

Fremont, Neb.—Will probably purchase street sweeper soon.

Grand Rapids, Mich.—Discussing garbage question.

Grand Rapids, Mich.—Will probably vote on $40,000 park improvements.

Jackson, Miss.—Plans preparing for garbage crematory. W. G. Kirkpatrick, City Engineer.

Lawrence, Kan.—Press calls for cleaner streets.

Lincoln, Neb.—May establish public park; may issue bonds for same.

Lorain, O.—Considering garbage disposal plant.

Los Angeles, Cal.—Want park in seventh ward. Edw. Kern, Councilman.

Marion, O.—Will have $50,000 garbage disposal plant.

Marion, O.—Will have sewage disposal plant.

Minneapolis, Minn.—$70,000 will be needed for parks this year.

New Bedford, Mass.—Considering garbage disposal plant.

Norristown, Pa.—Board of Health declares garbage disposal plant necessary.

Omaha, Neb.—Bids for garbage disposal not accepted.

Portland, Me.—May have new park.

Rochester, N. Y.—Wm. H. Sours has street sprinkling contract at $43,418.05.

Sandusky, O.—Considering plans for garbage disposal.

San Francisco, Cal.—Have issued $1,456,000 bond for park, etc. Chas. Fay, Clerk.

Sebring, O.—Estimated cost of sewage disposal plant is $50,000; plans preparing.

Springfield, O.—Considering sewage disposal plant.

Troy, N. Y.—Considering improvements to parks.

Waterbury, Conn.—Considering sewage disposal.

Wheeling, W. Va.—Chas. H. Becker has contract for garbage collection at $14,650.

Sealed proposals for the lighting of the streets, plazas and alleys of the City of San Antonio, Texas, for the ensuing two years, with the privilege of five, with either gas or electric lights, or both, will be received at the City Clerk's office until 3 o'clock P. M., April 6th, 1904. Specifications will be furnished upon application.

The City reserves the right to reject any and all proposals.

JOHN P. CAMPBELL, Mayor.

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